

ANNUAL REPORT

OF THE

**Indian Central Cotton Committee,
Bombay,**

FOR THE

**Year ending August 31st,
1925.**

CONTENTS.

	PAGE.
Personnel	1
Sub Committees	4
Staff	8
The Work of the Year	9
Regulation of Gins and Presses	11
Open Cotton Markets	13
Marketing of Improved Varieties of Cotton	13
The New Liverpool Futures Contract	15
Spinning Trials on Indian Cottons	16
Finance of the Cotton Crop	16
Measures to prevent the introduction of the Mexican Boll Weevil	17
Agricultural Research	18
Institute of Plant Industry, Indore	20
Technological Research	21
Research Students	22
Secretary's Tours	23
Collection and Supply of Information	23
Annual Report of the Director, Technological Laboratory	25

APPENDICES.

I. Opinions of Millowners regarding working of the Cotton Transport Act	35
II. Madras Notification under the Cotton Transport Act	36
III. Cotton Ginning and Pressing Factories Act, 1925, and the Indian Cotton Ginning and Pressing Factories Rules, 1925	44
IV. Note on Bill for Regulation of Gins and Presses	63
V. Areas under Improved Varieties of Cotton	67
VI. Liverpool, Empire and Miscellaneous Cotton Delivery Contract	69
VII. Spinning Tests on Indian Cottons	71
VIII. Preliminary Questionnaire on Finance of the Cotton Crop Up country	78
IX. Questionnaire for Village and Market Investigations	80
X. Press Communiques and Notifications regarding Importation of American Cotton into India	83
XI. Present Position of Cotton Research in India	89
XII. List of Scientific and Technical Officers	111
XIII. Programme of Cotton Investigation of the Indore Institute of Plant Industry	115
XIV. List of Research Students	117
XV. Introduction of Improved Varieties of Cotton in various Provinces	120

Annual Report of the Indian Central Cotton Committee, Bombay, for the Year Ending August 31st, 1925.

THE Central Cotton Committee was constituted by Resolution No 404-22, dated the 31st of March, 1921, of the Government of India in the Department of Revenue and Agriculture and was originally an advisory Committee. With the passing of the Cotton Cess Act the Committee was permanently incorporated and provided with funds of its own for the promotion of research for the improvement of cotton growing. The Committee's activities, therefore, fall into two main groups. In the first place it continues to advise the Government of India and Local Governments on matters connected with the improvement of cotton growing and cotton marketing—particularly on measures designed to prevent abuses and malpractices. In this capacity the Committee not only deals with such references as are made to it by Government, but continues to take the initiative in bringing to the notice of Government matters which require attention. In provincial matters the aim of the Committee is to work with and through the Provincial Cotton Committees which have been established in most provinces and to place at the disposal of the latter such information as will enable them to design measures to meet local needs.

Apart from its more formal activities the value of the Committee as a common meeting ground for all sections of the cotton industry is steadily becoming more apparent. In the administration of the cotton cess funds the Committee provides for research for the benefit of cotton growing in India as a whole, and this aspect of its work is steadily becoming more important.

PERSONNEL

The personnel of the Committee on August 31st, 1925, was as follows.—

1. PRESIDENT—The Agricultural Adviser to the Government of India *ex officio*, Dr D Clouston, C I E

REPRESENTATIVES OF AGRICULTURAL DEPARTMENTS.

<i>Madras</i>	..	..	Mr. R. C. Broadfoot, Cotton Specialist.
<i>Bombay</i>	..	..	Dr. H. H. Mann, Director of Agriculture;
<i>United Provinces</i>	..	..	Mr. G. Clarke, Director of Agriculture.
<i>Punjab</i>	..	..	The Director of Agriculture, Mr. D. Milne.
<i>Central Provinces</i>	..	..	The Director of Agriculture, Mr. F. J. Plymen.
<i>Burma</i>	..	..	Mr. T. D. Stock, Deputy Director of Agriculture.

3. THE DIRECTOR-GENERAL OF COMMERCIAL INTELLIGENCE, *ex-officio*.

4. REPRESENTATIVES OF CHAMBERS OF COMMERCE AND ASSOCIATIONS.

The East India Cotton

Association Mr. W. Ellis Jones.

The Bombay Mill-

owners' Association.. Mr. J. A. Kay, M.L.C. (Vice-President).

The Bombay Chamber

of Commerce.. .. Mr. V. A. Grantham, M.L.C.

The Indian Merchants'

Chamber, Bombay .. Sir Purshotamdas Thakurdas, Kt., C.I.E.,
M.B.E., M.L.A.

Karachi Chamber of

Commerce Mr. F. G. Travers.

Ahmedabad Mill-

owners' Association.. Seth Kasturbhai Lalbhai, M.L.A.

Tuticorin Chamber of

Commerce Mr. G. Z. Meli.

Upper India Chamber

of Commerce.. .. Mr. Bertram West.

The Empire Cotton

Growing Corpora-

tion Mr. W. Roberts.

5 and 6. COMMERCIAL REPRESENTATIVES NOMINATED BY LOCAL GOVERNMENTS.

<i>Central Provinces</i>	..	Mr. S. B. Mehta, C.I.E. Rai Bahadur K. S. Nayudu, M.L.C.
<i>Madras</i>	..	Mr. H. B. Moore.
<i>Punjab</i>	..	Rai Bahadur Seth Prabhu Dayal, M.B.E.
<i>Bengal</i>	..	Mr. B. K. Lahiri.

7. CO-OPERATIVE REPRESENTATIVE.

Mr. B. F. Madon.

8. REPRESENTATIVES OF COTTON GROWERS.

<i>Madras</i>	..	M.R.Ry. R. Appaswami Naidu Garu. M.R.Ry. B. P. Sesha Reddi Garu.
<i>Bombay</i>	..	Rao Bahadur Bhimbhai Ranchodji Naik. Prof. S. C. Shahani.
<i>United Provinces</i>	..	The Hon'ble Khan Bahadur Nawab Sir Muhammad Muzammil Ullah Khan, K.C.I.E., O.B.E. The Hon'ble Lala Sukhbir Sinha.
<i>Punjab</i>	..	Mr. H. T. Conville. Honorary Lieut. Rai Bahadur Chaudhri Lal Chand, O.B.E.
<i>Central Provinces and</i>		
<i>Berar</i>	..	Rao Sahib V. G. Kulkarni, M.L.C. Mr. N. V. Deshmukh.

9, 10 and 11. REPRESENTATIVES OF INDIAN STATES.

<i>Hyderabad State</i>	..	Mr. Mazhar Hussain, Director of Agriculture.
<i>Baroda State</i>	..	Director of Commerce and Industries, Dr. S. M. Pagar, M.A.
<i>Gwalior State</i>	..	Deputy Director of Agriculture, Mr. Hiralal H. Pandya.
<i>Rajputana and Central</i>		
<i>India States</i>	..	Mr. A. Howard, C.I.E., Director of the Institute of Plant Industry, Indore.

Additional persons nominated by the Governor-General in Council :

1. Mr. K. B. Tilloo, Representative of the Indore State.
2. Mr. W. Youngman, Economic Botanist for Cotton, Central Provinces.
3. Rao Sahib Bhimbai M. Desai, Deputy Director of Agriculture, Gujerat, Surat.
4. Dr. L. C. Coleman, Representative of the Mysore State.
5. Mr. G. R. Hilson.

Secretary (appointed by the Government of India)—Mr. B. C. Burt, B.Sc., M.B.E., I.A.S.

As will be seen, several changes in membership in the Committee took place during the year. A ballot for retiring members took place at the February meeting when 12 members retired all of whom were re-appointed. Mr. Grantham, the Committee's first Vice-President, retired from office at the end of February as he found it impossible to undertake the responsibilities of Vice-President in addition to those of the President of the Bombay Chamber of Commerce. The Committee are fortunate in that Mr. Grantham still represents the Chamber of Commerce on the Committee, and at their tenth meeting placed on record, by formal resolution, their appreciation of the services which he had rendered to the Committee. Mr. J. A. Kay, the representative of the Bombay Millowners' Association, of which he is a past President, was unanimously elected Vice-President in succession to Mr. Grantham;

SUB-COMMITTEES.

The following members were appointed to form the *Standing Finance Sub-Committee* required by the Indian Cotton Cess Rules :—

Mr. J. A. Kay, M.L.C. (Vice-President and Chairman, *ex-officio*).

Sir Purshotamdas Thakurdas.

Mr. B. F. Madon.

Rao Bahadur Bhimbai Ranchodji Naik.

Mr. W. Ellis Jones.

Mr. F. G. Travers.

Dr. H. H. Mann.

Mr. V. A. Grantham.

Under the Cotton Cess Act and Rules the Standing Finance Sub Committee, subject to such general directions as may be laid down by resolution of the Central Cotton Committee, controls the finances of the Committee. In many other ways it acts as an executive Sub Committee.

The Local Sub Committee during the year consisted of the following members —

Mr J A Kay (*Vice President*), Mr V A Grantham, Mr W Ellis Jones, Sir Purshotamdas Thakurdas, Mr I G Travers, Seth Kisturbhai Lalbhai, Mr G Z Meli, Rao Bahadur Bhimbhai Ranchodji Naik, Mr B F Madon, Dr H H Mann and Dr S M Pagar.

The object of this Sub Committee which includes all members of the Central Cotton Committee living in or near Bombay, is to deal with matters of general importance in the interim between meetings of the full Committee, to the meetings all members of the Central Committee who may be visiting Bombay are invited. This Sub Committee has performed most valuable work not only in dealing with various references from Government which required prompt attention but in the detailed examination of many matters dealt with by the Central Committee to which the Local Sub Committee reports. In particular, this Sub Committee worked out the detailed arrangements for the fumigation of American cotton to prevent the introduction of the Boll Weevil and the draft rules under the Cotton Ginning and Pressing Factories Act. Both these matters are of very considerable importance to the cotton trade. It is difficult adequately to appreciate the work which the above two Sub Committees have carried out during the year for without their assistance it would have been impossible for the Central Committee to have made the progress which it has achieved.

A new Standing Sub Committee was appointed by the Central Cotton Committee in February last in connection with the investigation of the finance of the cotton crop which has now been undertaken. This Sub Committee consists of the following members —

Mr. J A Kay (*Vice-President and Chairman, ex officio*), Dr H H Mann, Mr W Ellis Jones and Mr B F Madon.

Cotton Ginning and Pressing Factories Sub Committee — The following Sub Committee was appointed on July 6th, 1925, for the purposes of Section 2 (f) of the Cotton Ginning and Pressing Factories Act —

(1) The Vice-President (*Chairman ex officio*), Mr J A Kay

- (2) Five members representing the cotton trade who are residents of the Bombay Presidency :—

Mr. V. A. Grantham, Sir Purshotamdas Thakurdas, Mr. W. Ellis Jones, Mr. G. Z. Meli, and Mr. F. G. Travers.

- (3) Four up-country members :—

Madras Mr. H. F. P. Hearson.

United Provinces .. Mr. Bertram West.

Punjab Seth Prabhu Dayal.

Central Provinces and

Berar Mr. S. B. Mehta.

- (4) The Co-operative Representative.—Mr. B. F. Madon.

This Sub-Committee meets regularly, if business requires, on the first Monday of every month, its function being to deal with matters arising out of the administration of the Cotton Ginning and Pressing Factories Act.

Agricultural Research Sub-Committee.—This Sub-Committee meets in conjunction with meetings of the full Committee and examines research proposals, the progress reports on research schemes and the reports of research students. In addition, this Sub-Committee met three days prior to the February meeting of the full Committee and submitted to the Central Committee a report on the present position of agricultural research in India and a research programme. The Sub-Committee which met in February consisted of the following members :—

Dr. D. Clouston (*President*), Mr. J. A. Kay, (*Vice-President*), Messrs. Grantham, Broadfoot, Mann, Milne, Roberts, Madon, Lahiri, Deshmukh, Pagar, Howard and Sir Purshotamdas Thakurdas.

The Committee appointed at the February meeting for the succeeding twelve months consists of the following members :—

Dr. D. Clouston (*President*), Mr. J. A. Kay (*Vice-President*), Mr. A. Howard (Director of the Institute of Plant Industry, Indore), Mr. B. F. Madon (Co-operative Representative), Sir Purshotamdas Thakurdas (Cotton Trade representative), Mr. H. T. Conville (Cotton Growers Representative), Dr. H. H. Mann and Messrs. D. Milne, W. Youngman and R. C. Broadfoot (Representatives of Agricultural Departments) and the Secretary.

Technological Research Sub-Committee.—This Sub-Committee meets in connection with meetings of the Central Committee, and also at other times when necessary, to discuss matters arising out of the Committee's arrange-

ments for technological research and to advise the Central Cotton Committee and the Director of the Laboratory on the management and development of the Committee's Technological Research Laboratory. The Sub-Committee appointed in February consists of the following members.—

The Vice-President (Mr. J. A. Kay), Mr. S. B. Mehta, Dr. H. H. Mann, Messrs. D. Milne and B. West, and the Secretary.

Mr. Howard and Seth Kasturbhai Lalbhai were added to the Sub-Committee by resolution of the Central Cotton Committee passed at its eleventh meeting.

Selection Sub-Committees were appointed from time to time as required by the Cotton Cess Rules to deal with applications for appointments on the staff of the Committee.

MEETINGS

Three meetings of the Central Committee were held during the year under report, *viz.*, on December 3rd, 1924, on February 23rd to 25th, 1925, and on July 6th to 8th, 1925.

It is with pleasure that the Committee are again able to record a high standard of attendance at all its meetings. Unfortunately it has not always been possible to avoid clashing with meetings of the various Indian Legislatures, and on occasions this has made it impossible for some members to attend.

On December 3rd, 1924, His Excellency the Viceroy, Lord Reading, conferred on the Committee the honour of performing the opening ceremony of their Spinning Laboratory and laid the foundation-stone of the Technological Research Laboratory.

At their February meeting the Committee had the honour of a visit from His Excellency Sir Leslie Wilson, Governor of Bombay.

At the July meeting the Hon'ble Sir Muhammad Habibullah, Member of the Viceroy's Council for the Department of Education, Health and Lands, and the Hon'ble Mr. D. T. Chadwick, Secretary to the Government of India, Commerce Department, were present.

The Standing Finance Sub-Committee held eleven meetings during the year, the Local Sub-Committee seven meetings, the Special Sub-Committee

appointed to consider the finance of the cotton crop up-country five meetings and the Technological Research Sub-Committee three meetings.

STAFF.

Mr. Burt returned from leave on November 12th, 1924, relieving Mr. Hilson, who officiated as Secretary during his absence.

Mr. Turner held charge of his appointment as Director of the Technological Research Laboratory throughout the year under report.

Mr. R. P. Richardson was appointed Spinning Master of the Technological Laboratory on November 3rd, relieving Mr. Walmsley, who held that appointment temporarily, and has held charge of his appointment throughout the year.

The staff of the Technological Research Laboratory was considerably increased during the year and was also re-organised. Details will be found in the report of the Director.

Messrs. Sen and Dutt held charge of their appointments as Chemical and Microscopical Research Assistants respectively in the Technological Research Laboratory throughout the year.

Mr. Hari Rao, M.Sc. (one of the Committee's Research Students), and Mr. Bathija, M.A. (Cantab.), were appointed Junior Research Assistants in February 1925.

Cotton Research Botanist.—Mr. Trevor Trought, (recently Senior Botanist, Cotton Research Board, Ministry of Agriculture, Egypt,) was appointed to the post of Cotton Research Botanist for the Punjab and took up his duties during August 1925.

Provincial and Local Sub-Committees.—Provincial Cotton Committees continued to do useful work and meetings were held as follows :—

Madras, one meeting.

United Provinces, three.

Central Provinces and Berar, *nil*.

Punjab, two.

Burma, one.

In Bengal a Sub Committee of the Provincial Board of Agriculture deals with cotton matters. In Bombay no Provincial Cotton Committee has yet been appointed and many matters which normally would be dealt with by such a Committee were referred by the Government of Bombay to the Central Cotton Committee and dealt with mainly by their Local Sub-Committee. Divisional Cotton Committees have been appointed in Bombay for the following divisions —

Gujerat, Khandesh, Southern Division, and Sind.

With the exception of the Sind Committee meetings have been held regularly. In Madras, Local Cotton Committees exist for the following areas :—

Nandyal, Bellary, Guntur, Tuticorin and Tiruppur.

THE WORK OF THE YEAR.

THE COTTON TRANSPORT ACT

The Act was in force in the Bombay Presidency throughout the year in the following areas —

In Gujerat three zones were maintained, *viz*

The South Surat zone,
The Surat zone, and
The Olpad-Ankleshwar zone.

In the Southern Division also three zones were maintained, *viz* :

The Kumpta-Dharwar area,
The Bijapur area, and
The Bagalkot area.

The question of applying the Act to the protection of the Broach area is still under consideration

The Baroda Government continued to enforce a similar law and notified three zones corresponding with the Bombay areas.

The Rajpipla State also brought into force a State law on the same lines as the India Act, the whole State being constituted as one area since it now grows one improved variety of cotton

Most definite information has been received from all sources as to the value of the Act in improving and maintaining the quality of the cottons grown in these areas. The opinions of millowners, which are reproduced in Appendix I, show very definitely that since the Act was brought into force Indian mills have been able to purchase more freely of these stapled Indian cottons. Further, the recorded prices, relative to the prices of Broach futures, indicate that the improved quality of the cottons has been reflected in the prices paid. Local enquiry in the districts shows that enhanced prices have been realised by the cultivators.

A distinctly retrograde step was, however, taken by the Bombay Legislative Council in August 1924, when the notification was amended to permit of the wholesale movement of unginced cotton from the Olpad-Ankleshwar to the Surat area under license. In the opinion of the Central Cotton Committee, this premature withdrawal of restrictions cannot but react unfavourably on the reputation of Surat cotton. The policy of the Agricultural Department is to establish one variety of improved cotton south of the Narbada, and the realisation of this objective is in sight. At present, however, certain areas north of the Tapti still grow cottons which are distinctly inferior to genuine Surat cotton and command a lower price. So long as these conditions continue the distinction between the zones north and south of the Tapti should be maintained. Fortunately there is now every hope of the active assistance of the Co-operative Cotton Sale Societies in this tract being secured and that the inferior varieties will shortly be completely ousted.

In the Southern part of the Presidency the Act has continued to work smoothly. Such complaints of mixing as are now received refer to the mixing of ordinary Dharwar-American cotton with the Agricultural Department's improved strain of Upland, the mixing of ordinary Kumpta with the Department's pure strain of improved Kumpta and the mixing of Kumpta and Upland cottons. This question should largely settle itself as the areas under the improved varieties extend, and there is no doubt that the grosser forms of adulteration, such as the mixing of short-stapled Khandesh cotton or Bombay mill waste with valued stapled cottons, have been stopped.

During the last few weeks of the year the Madras Legislative Council passed the necessary resolution enforcing the Cotton Transport Act in three areas in that Presidency, *viz.*, the Tiruppur-Cambodia area, Northern and Westerns area and the Tinnevely area. A copy of the notification will be

found in Appendix II This gives effect to another of the Central Cotton Committee's recommendations and should do much to improve the reputation of the stapled cottons grown in those areas In the past bare faced adulteration has spoiled the reputation of these cottons has prevented the Agricultural Department's improved types from attaining their real value in the market and has caused steady loss to the cotton grower

It is as yet too early to comment on the zones adopted In one respect the notification differs from the recommendations of the Provincial and the Central Cotton Committees *viz*, in clause (3) which permits the importation of ginned cotton without restriction from certain other areas into the Tiruppur Cambodia area This exemption is intended to meet the needs of those zones at present not possessing pressing factories The view of the Central Cotton Committee as of the Provincial Cotton Committee, is that this is a temporary matter and that the necessary elasticity could better have been provided by the issue of licenses

It will thus be seen that the Act has now been applied to a large portion of the long stapled cotton areas in India As already stated the question of applying the Act to Broach is under consideration and it is understood that the Hyderabad State have under examination the question as to whether steps should be taken to protect the important Hyderabad Gaoran (Bani) cotton tract Of the remaining large areas growing long stapled cotton, the most important are to be found in the Punjab where the application of the Cotton Transport Act has not been practicable in the past owing to the considerable proportion of *desi* cotton which is grown in the same tracts With the steady increase of American cotton growing in certain parts of the canal colonies, notably in the Lower Bari Doab Colony, the question as to whether the Act would not be of value in reducing the amount of mixing which occurs at present will require consideration

REGULATION OF GINS AND PRESSES.

The Cotton Ginning and Pressing Factories Act was passed by the Indian Legislature in March last The Act and Rules will be found in Appendix III This Act is a necessary corollary to the Cotton Transport Act and should do much to enable the cotton trade actively to discourage the various malpractices which at present occur in a certain number of ginning and pressing factories The Committee's recommendation that power should be given to Provincial Governments with the consent of Provincial Legislatures, to introduce the actual licensing of pressing factories, finds no place in the

Act, the general consensus of opinion being that it was first necessary to ascertain how far the marking of bales and the maintenance of records would serve the desired object. The Act as passed enables a purchaser at any stage to trace a bale of cotton to the factory where it was pressed and thence, by means of the press records, to the original owner. The ginning factory records provide information by means of which, in case of need, the chain of ownership can be carried further back. Thus the trade has been placed in a position to protect itself against abuse. The bearing of the Act on the improvement of cotton growing is discussed in a pamphlet issued by the Committee while the Bill was in course of circulation which will be found in Appendix IV.

The Act also provides for weekly returns of cotton pressed throughout British India, thus affording for the first time statistics of the greatest value to the whole of the cotton trade.

In connection with the rules under the Act, the most important point has been the method for the marking of bales. The Committee's original proposal was that the press mark and serial number (*i.e.*, the press mark, year and running number of the bale) should all be punched on the central hoop. In the opinion of many, this is the best way of ensuring that so long as a bale of cotton remains a merchantable bale it will carry the press mark. In the light of the opinions received on the draft rules, the Central Cotton Committee advised the Government of India that for the present it would be sufficient to stencil the running number of the bale on the hessian of a flat lashed side of the bale. In coming to this decision they were guided by the fact that the main feature is the mark denoting the press which it is essential to place on the hoop. The application of the press mark to the hoop presents no difficulty as the hoops can readily be marked before lashing the bale. Some little doubt, however, was expressed as to whether the running number could be punched on the hoops after pressing. As the correct application of these numbers to the hoops before lashing would require careful organisation in the press, it was decided to give press owners the option of either punching the running number on the hoop or of stencilling it on the flat side of the bale.

The full value of the Act will not be realised until the cotton-growing Indian States enforce similar legislation. Fortunately it is understood that the more important States are already taking steps to introduce the necessary laws.

OPEN COTTON MARKETS

The Bombay (Districts) Cotton Markets Bill, to which reference has been made in previous reports, is still under the consideration of the Local Government. No further steps have been taken for the improvement of primary cotton markets in Madras although the Provincial Cotton Committee has continued to urge the importance of this matter. The present position, therefore, is the same as it was when the Indian Cotton Committee reported in 1918, and only in the Central Provinces and Berar are primary markets properly organised and controlled. A very careful examination of the subject by the Provincial Cotton Committee showed that in the Punjab local conditions demand a modification of the Berar system if cotton markets are to be successful. In that province the density of cotton cultivation is comparatively low and general market organisation somewhat backward, and further the markets must serve for other commercial crops such as wheat and oil-seeds. Hence the system in force in the Central Provinces and Berar and recommended for Bombay—provinces in which cotton forms by far the most important market commodity—requires modification. The essential feature of the Indian Central Cotton Committee's recommendation is that growers shall be fully represented on cotton market committees. The Committee have now advised that in the Punjab, and in other provinces with like problems, it is desirable to investigate the possibilities of cotton market committees which would regulate the condition of cotton trading but which would not assume the general management of the markets.

MARKETING OF IMPROVED VARIETIES OF COTTON

The Indian Central Cotton Committee has continued to devote considerable attention to means by which the marketing of improved varieties of cotton can be assisted. There are two aspects of this problem where such assistance appears to be necessary. In the first place, the work of the Agricultural Departments would be rendered much easier if, during the early stages, the cotton grower could obtain the true intrinsic value of his produce. Since trade organisation necessarily is designed to deal with the cotton crop of a particular tract as it is and not as it should be, it follows that when a cotton of superior staple is introduced into a short-staple cotton tract the new cotton not only will not at once command its real value in local markets but may even be discriminated against—especially if it possesses a lower ginning percentage than the local variety. The problem, therefore, is to tide over the intervening stages until the new variety is forthcoming in

truly commercial quantities and to see that the new variety reaches the spinner in a pure and unmixed condition. Thanks to the assistance which individual members of the cotton trade have always been willing to give, the Agricultural Departments often have been able to organise the sale of their new cottons while they were building up their seed supply and carrying out district demonstrations. Individual buyers are usually ready to pay full prices for special lots of cotton from seed farms, etc., and it is not until the systematic introduction of a new variety has met with appreciable success and the replacement of existing varieties has made some progress that any real difficulty is met with. But a stage must always be reached where the crop has become too large for the Agricultural Department to handle and yet where trade buying is not sufficiently developed to ensure a proper market. Secondly, it appears necessary to furnish consumers with better means of knowing what new cottons are available and what they are like ; this is especially true of foreign markets. The bulk of the export trade in Indian cottons is in short-stapled varieties and is organised accordingly. The export of Indian stapled cottons, though relatively small, is considerable in the aggregate and the interests of spinner and grower alike demand that the exportable margin of such cottons shall be increased and the market for them widened so that production may be encouraged and the basis of supply broadened. Here a practical difficulty is that exporters sell mainly on private types which do not correspond with agricultural varieties and that the maintenance of the private type system is considered essential.

In two directions the Central Cotton Committee have been able to take constructive action. In the opinion of the Central Cotton Committee trade buyers would be forthcoming for quite small commercial lots of improved cottons if it were known with certainty where such cotton could be obtained and in what quantities. In Appendix V will be found a summary of information collected from the various Agricultural Departments showing the area under improved varieties of cotton, estimated production, and the principal markets. This information has now been supplied to the trade through Chambers of Commerce and Trade Associations. It is hoped that, coupled with the results of actual spinning tests, which the Committee publishes from time to time, such reports will help materially to promote the demand for the best Indian cottons.

The second direction in which the Committee has taken action to bring improved varieties of Indian cottons to notice is by the provision of type

bales for Cotton Exchanges at the major consuming markets. In this matter the Committee has received the hearty co-operation of the East India Cotton Association, the Liverpool Cotton Association and the Manchester Cotton Association, all of which have undertaken to receive type bales and to so display them that they will be seen by spinners and other buyers. These bales are described by the Agricultural Department's varietal names and enable buyers and sellers alike to compare the Agricultural Department's types with those offered for sale by the trade.

THE NEW LIVERPOOL FUTURES CONTRACT.

It is also of interest to record that the Liverpool Cotton Association have recently introduced a new futures contract for Empire and outside growths; trading in the new contract started from September 1st, 1925. The necessity for a hedge contract against which Empire cottons will be tenderable has received a good deal of public attention during the last eighteen months. The original proposal that Empire cottons of suitable staple should be made tenderable against the Liverpool-American futures contract was decided to be impracticable and a new contract was designed. Through the courtesy of the Liverpool Cotton Association a copy of the new contract is reproduced in Appendix VI. It will be observed that it is of very limited application to Indian cottons since no cotton is tenderable unless equal or superior in value to Strict Low Middling American and of fair staple—a condition which definitely rules out all short-stapled Indian cottons. It is not at present clear to what extent Indian stapled cottons will be tenderable against the new contract. The combination of a value contract with a Strict Low Middling clause (as compared to a Low Middling clause in the American futures contract) seems likely to exclude a number of cottons which, for many purposes, are capable of replacing American. On the other hand, it is argued that were the contract made too wide, especially at the outset, it would not attract buyers and it is certainly essential that the contract should be such as will be freely traded in.

At any rate, a definite step forward can be recorded and for the first time a Liverpool futures contract is in existence against which the best Indian cottons can actually be tendered. If the new contract proves a success it should be of considerable value in maintaining parity in prices between American cotton and Indian stapled cottons.

SPINNING TRIALS ON INDIAN COTTONS.

A reference was made in the last report to the Committee's exhibit of Indian cottons at the British Empire Exhibition at Wembley. That exhibit undoubtedly served a useful purpose in bringing to the notice of both British and Continental spinners Indian cottons with which they were unacquainted. Thanks to the assistance of the Indian Sub-Committee of the Empire Cotton Growing Corporation, it was possible to organize a series of spinning trials under standard Lancashire conditions in several Oldham mills. For the results of these tests we are indebted to the Oldham Master Cotton Spinners' Association whose report is reproduced in Appendix VII. It will be seen that of the new varieties introduced by the various Provincial Departments of Agriculture, several are definitely capable of replacing American cotton for many purposes. A further series of such trials is being conducted on sample bales from the 1924-25 crop. In addition, the results of spinning trials conducted in the Committee's Technological Laboratory have been published as a bulletin. A second bulletin in which the results of spinning trials on 16 Indian cottons from the 1923-24 and 1924-25 crops is now under preparation.

FINANCE OF THE COTTON CROP.

At the request of the East India Cotton Association, the Committee examined the possibilities of an enquiry into the financing of the cotton grower with special reference to his power to hold his produce for short periods during a temporary slump in prices. The original reference suggested that this had an important bearing on the question of broader hedge contracts. The Committee decided to express no opinion on the bearing of such an enquiry on the question of hedge contracts as on this matter there are two distinct schools of thought. They agreed, however, that such an enquiry was justified in connection with the Committee's general study of cotton marketing, and on the clear understanding that the object of the enquiry should be to ascertain the growers' needs and difficulties. Eventually such an enquiry should indicate means by which the grower can be helped.

A preliminary questionnaire * was issued, to which some 200 replies were received from Agricultural and Co-operative officers, non-official co-operative workers, banks, merchants and large cotton growers. Much

* Appendix VIII.

interesting information was received but, as was to be expected, the replies consisted largely of expressions of opinion rather than statements of ascertained facts. From the information so received, however, it was possible to decide on certain areas for which more detailed information was needed, and it was decided to undertake a limited number of local investigations, carried out by full-time investigators. The scope of these local investigations will be clear from the questions issued to investigators (Appendix IX). Briefly this is an attempt to find out for a limited number of villages and markets exactly what existing conditions are. The essential feature of these local investigations is that, for the villages and markets selected, answers to the questions will be obtained from every cotton grower in the village and every seller in the market on certain days. Only in this way does it seem possible to obtain any real picture of actual conditions.

The course of the enquiry in the future will be determined largely by the results obtained from the three investigations now in progress in Khandedh, Berar and the Northern and Western cotton tracts of the Madras Presidency. For these investigations trained staff has kindly been lent by the Agricultural Departments concerned. Meanwhile the detailed examination of the replies received to the preliminary questionnaire probably will afford a considerable amount of information for certain areas.

MEASURES TO PREVENT THE INTRODUCTION OF THE MEXICAN BOLL WEEVIL

References have been made in previous reports to the possible danger of the introduction into India of this dreaded pest through the medium of American cotton imported for spinning purposes. Such imports are usually small, but their total prohibition would only be justified as a last resource. The Central Cotton Committee consequently recommended that such imports should be limited to a single port for the whole of India, *viz*, Bombay, and permitted there only on condition of proper fumigation. The necessary experimental work has now been completed and is referred to in detail in the report of the Director of the Technological Laboratory. The commercial side of the question was carefully examined by the Local Sub Committee and a scheme of fumigation in barges worked out in detail. The Committee's final recommendations to the Government of India stated the conditions which should be fulfilled in order that these imports, which vary greatly in volume in different seasons, might be dealt with in such a way as to cause the minimum of inconvenience to the trade. A copy of the Government *communiqués* on the subject and of the notifications and rules which were

issued shortly after the close of the year will be found in Appendix X. The Committee's recommendations were accepted by the Government of India who have provided the necessary equipment and have made arrangements with the Bombay Port Trust for the carrying out of actual fumigation. Fumigation fees have been kept as low as is consistent with the principle that the cost of fumigation, including the ultimate recovery of the capital cost of initial equipment, should be recovered from the importer.

RESEARCH.

As a result of discussion on Agricultural Research at the eighth meeting of the Central Cotton Committee in July 1924, it was decided that the Committee should attempt the formulation of a definite programme of agricultural research and should review their policy in this respect. A note by the Vice-President and a technical note by Mr. Hilson were briefly discussed at the December meeting of the Committee and arrangements made for a thorough examination of the position by the Agricultural Research Sub-Committee prior to the February meeting. A report on the present position of cotton research in India was prepared, which was discussed by the Sub-Committee and subsequently by the full Committee and, as finally adopted, will be found in Appendix XI. Proceeding from this the Committee formulated a list of problems requiring investigation, and further defined somewhat more precisely the Committee's attitude towards agricultural research. The Committee's funds, though considerable, are by no means inexhaustible, and many aspects of research for the improvement of cotton growing are, and must remain, the function of the Provincial Departments of Agriculture. The Committee emphasised the fact that the cotton cess was not intended either to permit of competition with Provincial Departments or to relieve provincial budgets of normal expenditure for the improvement of agriculture. But there remains a large and important sphere of work on the more general problems connected with cotton growing which is open to the Committee. It has been laid down as a primary condition that the Committee will support only such schemes as are of general and wide applicability and that such grants as they give must be to enable new and additional research work to be undertaken.

Madras Pempheris and Physiological Research Scheme.—At its July meeting the Committee adopted one new scheme of work in furtherance of its new programme, *viz.*, the provision at Coimbatore of staff for a group of three inter-connected investigations. In the first place this scheme will provide for the continuance and development of the physiological work on

bud, flower and boll shedding started by Mr Hilson and it will also provide for investigations into the best means of dealing with the cotton stem weevil (*Pemphres affinis Faust*) pest. The Stem Weevil, at one time believed only to be a minor pest in the Madras Presidency, has lately shown signs of extension and has caused considerable damage. Whether it can be controlled by means of a more rigid application of the Madras Pest Act has yet to be proved and a most important practical problem is the search for resistant varieties. Preliminary results indicate that such varieties exist, but the reasons for their relative immunity are not understood. The project, therefore, provides for a Research Botanist who will be in charge of the scheme, a Bio Chemist and Botanical, Chemical and Entomological Research Assistants. As a result of these investigations it is hoped that by the selection of the most suitable strains of cotton and by special methods of cultivation indirect means of reducing the damage caused by this pest will be found.

At the tenth and eleventh meetings of the Committee progress reports on the various research schemes were considered in considerable detail. None of the investigations have been in progress for a sufficient time to enable any practical results to be published, but in all cases ample evidence was received that work was proceeding on sound lines and that results which can be translated into agricultural practice may be expected in the near future.

The Sind Research Scheme, to which reference was made in the last report, has now been brought into being. The Government of Bombay's scheme for agricultural research in Sind in connection with the Lloyd Barrage canals has now been sanctioned and the necessary funds voted by the Legislative Council and the main lines of work have been settled. The Indian Central Cotton Committee have made a grant to provide for a Physiological Botanist and staff for investigations into the behaviour of various types of cottons under new canal colony conditions.

As already mentioned the Cotton Research Botanist for the Punjab was appointed during the year under report and work on the Lyallpur scheme has now been started.

Research for the improvement of living plants is necessarily somewhat slow and, unlike many forms of research in applied science, preliminary results are necessarily unsuited for publication. Perhaps the best summary of the action which the Central Cotton Committee has taken for the promo-

tion of research for the improvement of cotton growing lies in the statement that the Committee's grants have made possible the employment of 51 additional scientific workers. In Appendix XII will be found a list of research workers paid from the Committee's grant.

INSTITUTE OF PLANT INDUSTRY, INDORE.

Mention has been made in previous reports of the Committee's scheme for a central Agricultural Research Institute for cotton work and in last year's report it was stated that the details of the scheme for the establishment of an Institute of Plant Industry at Indore had been completed. The Institute is maintained by grants from the Indian Central Cotton Committee and from the Durbars of the following Central Indian States :—

Indore, Datia, Dhar, Dewas (Senior), Rutlam, Jaora, Sitamau, and Narsingarh.

The President (Dr. D. Clouston), Sir Purshotamdas Thakurdas and the Secretary have represented the Committee on the Governing Body of the Institute throughout the year. The first meeting of the Governors took place in November 1924, and thanks to the hearty co-operation of the States and, in particular, of the Indore State, very rapid progress has been made in the completion of the Institute. Most of the land has already been laid out and the experimental work on cotton started during the current season. The buildings have also been completed and fully equipped. An additional grant of some six thousand rupees from the various contributing States, being the residue from an old fund for the provision of a joint Agricultural Adviser for the Central Indian States, has materially assisted in the provision of an up-to-date library.

The Institute will issue its own annual report which will be published by the Governors, but it is permissible here to refer to the general programme of cotton investigations which formed the basis of the scheme, and which will be found in Appendix XIII. Briefly, the Institute is undertaking a general study of cotton genetics and cotton physiology for which, being situated in the largest homogeneous cotton-growing tract in India, it is admirably suited. A special study is also being made of the Central India cottons, some of which are believed to be of considerable value. It is also expected that a thorough study of the Bani (*G. indicum*) group of cottons will be possible. It seems clear that many of the problems selected for investigation in the Committee's research programme can be conveniently

studied at Indore, and in particular it is hoped to make provision there for a study of cotton cytology. From the beginning of the 1926 season some of the Committee's research students will work at this Institute

TECHNOLOGICAL RESEARCH

A detailed account of the work of the year will be found in the report of the Director which will be found on page 25. The Spinning Laboratory has been fully occupied throughout the year on tests on cottons for Agricultural Departments and on standard Indian cottons, the total number of samples dealt with being 51. The standard Indian cottons are mainly those improved varieties which the Agricultural Departments have established on a commercial scale and the results of these tests are supplied to Indian spinners and to the cotton trade in general. With a view to determining the effect of climate on lint quality and the extent of the seasonal variations, tests on these cottons grown under standard conditions are being repeated annually. The routine for the Experimental Spinning Plant has now been thoroughly worked out and it has been proved that satisfactory results can be obtained from duplicate spinnings on five-pound samples. As will be seen from the Director's report, a similar preliminary survey was necessary of the detailed work to be done in the Testing room and of the organisation required to carry this out. Such work and the subsequent selection and training of the staff occupied a considerable time and in consequence the work of the Testing room lagged behind the work of the Spinning room. Hence it was not possible to furnish results to Agricultural Departments as promptly as was desired, but in all cases where results were needed before the next sowing season it was possible to send out preliminary reports. With the present organisation it will be possible to deal promptly with any reasonable number of Agricultural Departments' samples provided that where results are required before the next sowing season there is no delay in the despatch of the samples to the Laboratory once the crop is harvested.

The staff of the Research Laboratory has also been reorganised and extended during the year, and a certain amount of work on fibre characters has been possible in the temporary laboratory. The main Research Laboratory was completed and occupied shortly after the close of the year.

As already mentioned, there are a number of problems in which the Technological Research Laboratory will co-operate with the various Agricultural Departments. As the spinning test forms the basis of work of the

Laboratory, attention was concentrated on developing this side in the first instance. Further; there is probably no direction in which the Committee can render more effective aid to the cotton breeder than in providing him with authoritative reports on the spinning value of his experimental cottons. But the study of fibre characters and their bearing on spinning value in the Research Laboratory is an equally important aspect of our work, and provision has been made for considerable development in this direction. As results indicating the bearing of the various measurable characters of the fibre on the spinning value are obtained it should be possible to design laboratory methods which will supplement, and in the early stages of plant breeding work perhaps even replace, the actual spinning test. Further a very careful examination of the subject by the Research Sub-Committee has indicated the great need for the analysis of spinning value from the plant-breeder's standpoint. The work of recent years in various parts of the world has resulted in a considerable amount of information as to the factors determining the agricultural yield of cotton, but much less work has been done on the factors which determine quality. There is thus a wide field of work before the Laboratory.

No account of the work of the Laboratory would be complete without an acknowledgment of the valued assistance received from several members of the East India Cotton Association who have undertaken the grading of the various samples of cottons submitted to the Laboratory for spinning trials. The grader's report has formed an integral part of the reports on new cottons.

The Laboratory has also carried out, during the year, an investigation of some magnitude in connection with the fumigation of American cotton for the prevention of the introduction of the Boll Weevil, the results of which are referred to elsewhere in the report.

RESEARCH STUDENTS.

Eight research students were appointed in February who took up their studentships in April 1925—one has since resigned. A complete list of the Committee's research students showing in which branch of cotton research they are engaged and where they are posted will be found in Appendix XIV.

One of the students appointed in September 1923 has recently been appointed as an Assistant Mycologist in connection with the Central Provinces research scheme, and at the end of the year proposals for similar

employment for four others were under consideration. One research student has also been appointed Junior Physicist on the staff of the Technological Laboratory. It was decided during the year that a limited number of senior research studentships should be awarded in future in addition to the usual annual appointment of six junior research students.

SECRETARY'S TOURS

The Secretary was on duty at the headquarters of the Government of India on several occasions in connection with the Cotton Ginning and Pressing Factories Act and the rules under the Act. Visits were also paid to Cawnpore, Layallpur, Lahore, Coimbatore, Madras, Surat, Dharwar and Indore in connection with the Committee's research schemes and to attend meetings of Provincial Cotton Committees.

COLLECTION AND SUPPLY OF INFORMATION

As was done last year, a note on the recent progress in the introduction of improved varieties of cotton has been contributed to the *Bombay Cotton Annual* which is published by the East India Cotton Association. The substance of this is reproduced in Appendix XV.

The Committee is again indebted to the British Cotton Industry Research Association for the supply of their weekly summary of current literature in which abstracts appear of all work published in connection with cotton growing and cotton technology and reference is made to the scientific work bearing on these subjects and also for the supply of copies of the Shirley Institute Memoirs.

To the Empire Cotton Growing Corporation the Committee are also indebted for the supply to the library and to members of the Committee copies of their own proceedings of special reports obtained by them on cotton prospects in other parts of the Empire and of their *Review* which is published quarterly. They have also supplied us with a considerable amount of information in regard to special cotton legislation in other countries.

The Committee has in addition a large circle of Government Departments and public bodies, interested in cotton, both within and outside the Empire with whom an exchange of publications is made.

The Committee has published during the year the following bulletins :--

1. The Technological Research Laboratory of the Indian Central Cotton Committee.
2. Some recent important speeches in connection with the improvement of cotton growing in India.
3. Conduct of spinning tests in the Technological Laboratory.

As soon as a Deputy Secretary is appointed the abstracting of Indian agricultural literature on cotton investigations will be undertaken and abstracts published in the *Agricultural Journal of India*. The object of these abstracts is to provide for those engaged in research or development work connected with cotton growing, more convenient means of reference to the work being carried out in different parts of India than are available at present.

Annual Report of the Director, Technological Laboratory, Matunga, 1924-25.

IN the last Annual Report a general account was given of the objects of the Technological Laboratory and of the means and methods by which it was proposed to make the attempt to accomplish these objects. A noteworthy event of the year was the visit of His Excellency the Viceroy who, on December 3rd, 1924, formally opened the Spinning Laboratory and laid the foundation-stone of the Research Laboratory. During the year under review considerable progress has been made in all directions, as the detailed account below will show. The various details may be considered under the four following heads —

- I Spinning Laboratory—Buildings and equipment
- II Research Laboratory—Buildings and equipment
- III Staff
- IV Work of the Technological Laboratory

I SPINNING LABORATORY—BUILDINGS AND EQUIPMENT

As regards the Spinning Laboratory building there is little to add to the description given in last year's report.

The most notable feature of new equipment is the installation of the Carrier Humidifying System. The plant was ready at the end of May and tests conducted during the monsoon amply demonstrated that under the conditions then prevailing the Company's guarantee was easily fulfilled. Further tests will be made during the cold weather (January-February)—when the conditions are the most onerous so far as the plant is concerned—and also later during the hot weather (April-May). There can, however, be no doubt as to the general efficacy of the plant and conditions in the Spinning Laboratory since the plant was installed have been far more satisfactory than at the corresponding period in the previous year. It may be added that the Carrier Company guarantees that the relative humidity will be automatically maintained within 2 per cent, and the temperature within 2° F. of the values for which the controls are set.

II RESEARCH LABORATORY—BUILDINGS AND EQUIPMENT

The new Research Laboratory was completed by the end of the monsoon, 1925. A brief account of the allocation of the floor space, together with a block plan, was given in the last Annual Report. The various labora-

tory services—water, drainage, electricity and gas—have been satisfactorily provided ; they are in all cases taken round the walls of the rooms so as to allow the maximum adaptability of the rooms to other purposes than those for which they are being used initially, in view of the fact that the expansion of the Laboratory's activities may at some future time render such adaptability desirable.

The new laboratory was actually occupied on September 28th, 1925, the whole of the furniture, equipment and apparatus being removed from the temporary laboratory in the Victoria Jubilee Technical Institute on that date. Normal working was resumed in the new laboratory on the following day. In actual working the new laboratory has been found quite satisfactory, being lofty, spacious, well-lighted, and generally airy. The floors of the various rooms have been tiled with square red tiles of eight-inch side except the experimental workshop, which has been paved with Tandur stone.

It had been found that the laboratory furniture on the " unit " principle was both economical in cost and very suitable for the needs of the laboratory. The additional furniture required for the new building was therefore obtained to the same patterns.

A small instrument makers' workshop has been provided to enable as much apparatus as possible to be made on the spot. It is fitted with one 6-inch Selson lathe, one $3\frac{1}{2}$ -inch Drummond lathe, one 6-inch shaping machine, one sensitive drilling machine, one wet and dry grinding machine, one power hack-saw, and the usual workshop bench and hand tools. The power is taken from a 5 h.p. motor driving a floor shaft through a worm reduction gear, the countershafts being mounted on a plank carried by beams let into the outside south wall.

The great amount of testing work which has had to be carried out has necessitated the provision of additional testing appliances, *viz* :—

- One Goodbrand Twist Tester.
- One Goodbrand Single Thread Tester.
- One Balls Sorter.
- One Bunge Micro-balance.

III. STAFF.

As the Laboratory began to fulfil the functions for which it had been instituted, it became increasingly evident that more staff would be necessary to cope with the large amount of testing work which arose from the numerous demands for spinning tests. A note was presented to the Committee

at its meeting in February 1925, on the organisation necessary for carrying out with maximum efficiency the spinning tests and the accessory tests. The necessity for co-ordinating the work of the testing room with that of the spinning room was discussed, and the number of staff indicated which was needed to make effective the scheme propounded. It was felt at the time that for testing work of this kind non graduate assistants might be appointed who would be able, under proper supervision, to carry out the testing work satisfactorily. The experiment was accordingly tried a little later, when some vacancies occurred in the testing staff, and it proved to be quite successful. The whole matter of the staffing of the Technological Laboratory was gone into by the Committee at its meeting in July when sanction was given to a system of grading the staff and for certain additional appointments.

The following is the sanctioned scale —

Director.

Spinning Master

3 Senior Research Assistants

3 Junior „ „

1 Head Tester

1 Statistician

1 Senior Tester (two while no Head Tester)

10 Junior Testers and Routine Assistants

Electrician

1 Draughtsman.

IV WORK OF THE TECHNOLOGICAL LABORATORY

1 *Spinning Tests* — Considerable progress has been made during the past year in the work of the laboratory. From the very first when the resources of the laboratory became available they have been taxed to the utmost. In the last Annual Report a statement was made of the records which it was proposed to keep for each spinning test. Except for one or two items on which some research is necessary these have been maintained in a systematic manner, with full details, from the commencement. There is no doubt that the greatest advantages of these records will be reaped in future years, for example, they will be invaluable when analyses have to be made of the behaviour of different cottons over a series of years. These records comprise all possible particulars of the machinery, the material, and the physical conditions under which the spinning and yarn tests are carried out. As an example of the thoroughness with which these records are kept, the recording of the temperature and relative humidity may be

cited. Readings are taken hourly from 8 a.m. to 5 p.m. of four ordinary wet and dry bulb hygrometers, one of which is in the blow room, two in the main spinning room, and one in the testing room. In addition, hourly readings of a whirling hygrometer are also taken near the positions of the stationary wet and dry bulb hygrometers. The whirling hygrometers have been made to a special pattern having a very open scale specially suited for the conditions of their use in the laboratory. These readings are supplemented by the readings of two continuously recording hair hygrographs so as to indicate changes of humidity during the night when the plant is not working but when cotton is usually on the machines and may therefore be affected in condition. A thermo-hygrograph which will give continuous records of temperature as well as of humidity is being added to this equipment. All charts from these instruments are suitably labelled and filed. The whirling hygrometers and the hygrographs are calibrated against an Assmann Psychrometer which itself is provided with standardised thermometers of a very open scale type specially made for use in the laboratory. These readings were available for many months before the humidification plant was installed; they now serve as a check upon this plant in the rooms humidified by it.

A good deal of attention has been given to the storage of samples. The present practice is to keep a sample of the raw cotton, and of the cotton in the stages of sliver, slubbing, intermediate, roving, hank-roving, and yarn. Each sample is placed in a tin having a false bottom; the bottom of the tin is removable and contains quicklime to keep the material in a dry condition; the false bottom consists of perforated sheet metal across the bottom of the middle portion of the tin; a circle of cotton duck fits above this bottom in order to prevent lime-dust rising into the middle of the tin where the material is kept securely wrapped in a good quality paper. The tin is provided with a deep lid. By this means and by making occasional changes of the lime, it is hoped to keep the material in good condition. The tins are of various sizes, being designed to take the various sizes of bobbin, etc., and they are systematically arranged in racks specially designed to hold them. There can hardly be any doubt as to the necessity for some such procedure as that described in view of the well-known fact that changes in colour occur in cotton which has been stored for some time. Whether corresponding changes occur in other properties is a most important matter which it is intended to investigate as soon as opportunity offers.

2. *Standard Indian Cottons*.—Reference was made in the last Annual Report to the tests on the standard Indian cottons on which it was proposed to concentrate for a time. It was found, however, that there were so many

problems on which these tests could be utilised to throw light that it was not possible to make as much progress as had been desired. Of the 1923-24 crop, the following cottons were available.—

1. Dharwar No 1
2. Gadag No 1
3. Surat 1027 A L F.
4. Punjab-American 285 F
5. Coimbatore 1 (Cambodia 295).
6. Nandyal 14
7. Hagari 25
8. Karunganni

Of these it was only found possible to complete the tests on 3 (Surat 1027 A L F), 4 (Punjab American 285 F), 5 (Coimbatore 1) and 8 (Karunganni). Early in 1925 a preliminary bulletin was issued showing the results which had been obtained on the first three of these cottons. It was accompanied by an explanatory note indicating the purposes for which the tests had been conducted, and describing at some length the procedure adopted in making the spinning tests and the accessory tests. In response to an invitation for comments on the bulletin some useful suggestions for improvement were received, which will be embodied in the standard form which has, as a consequence, now been adopted for reporting the results of the spinning tests. A copy of this form* is shown in the appendix to this report. In addition to the items there shown the full report on a sample contains the results of the examination of the raw cotton in the Research Laboratory, the grader's report, as well as a report on those properties which are judged from the appearance of the yarn on the yarn examining machine.

While making these tests on the standard cottons it is sought to obtain answers to a number of ancillary questions of the greatest importance. The first of these questions is—What is the minimum weight of sample which can safely be taken for the spinning test without endangering the trustworthiness of the test? This matter is of supreme importance because cotton breeders wish to have tests on their cottons made at as early a stage as possible in their work, when in the nature of the case only small weights are available. They would be considerably hampered in their work—on account of the time, staff, and land necessary—if they were required to furnish, say, at least 100 lbs of each cotton which it was desired to test. It is commonly believed by mill managers and others whose long experience of mill practice certainly entitles their opinion to respect, that it is impossible to make a satisfactory spinning test on a less weight than 100 lbs. But while this is probably true for the

* See page 14.

mill, where the conditions ordinarily prevailing make it practically impossible to adapt the procedure to the testing of a small weight of a special cotton, it cannot therefore be laid down as an axiom that under all conditions whatsoever tests on small weights of cotton must necessarily be unsatisfactory or at any rate untrustworthy. Indeed, experience elsewhere of small spinning plants specially erected for dealing with small weights of cotton all points in the other direction. It was with a view to gaining really definite information on the subject that spinning tests have accordingly been made in the Technological Laboratory on the standard cottons on weights of 100 lbs., 10 lbs., 5 lbs. (2 lots), and 2 lbs. (2 lots), respectively. So far as the results already obtained are concerned, they indicate that the duplicate samples of 5-lb. weight give, as nearly as could be expected, the same results as the 100-lb. samples. Even the duplicate 2-lb. samples have been found to give very similar results to those given by the larger samples, especially in the latest tests where the benefit of past experience is obtained. But the very greatest care in manipulation of such small samples is a *sine qua non*. With the ordinary care of the trained operative staff, the tests on 5-lb. samples appear to be quite reliable. The whole situation will be reviewed at a later date when the results of tests on the other standard cottons are also available.

These tests on the standard cottons have been so designed that they will incidentally throw some light on the two other questions—(i) the deterioration of cotton on storage; and (ii) the effect of the physical conditions—temperature and humidity—under which the spinning tests are carried out. Knowledge on these matters is most desirable. Not only does it possess an intrinsic general interest and importance, but from the point of view of the Technological Laboratory such knowledge is essential, because it may prove necessary to make repeat tests on a sample some time after the original tests were made, and then the possibility of effects due to deterioration on storage or to differences in the conditions of testing would have to be faced. The installation of the Carrier system of humidification in the Spinning Laboratory renders it possible to have standard conditions of temperature and humidity all the year round; but as the cost of de-humidifying plant is prohibitive the standard conditions must be so chosen that even in the monsoon they may still be maintained. Such conditions are a temperature of 92° F. and a relative humidity of 70 per cent. These conditions in the Spinning Laboratory occasion much personal discomfort to the staff so that it is most desirable to avoid if possible their adoption as all-the-year-round conditions. It would be an obvious benefit to work

under those conditions which ensure the maximum of comfort without vitiating the spinning tests. The tests on the standard cottons, together with the control of conditions which can be exercised by means of the Carrier plant, will yield information which will enable this to be done.

3 *Tests for Agricultural Departments*—Early in 1925, there came a great rush of samples to be tested for Agricultural Departments which practically put an end to the testing of the standard cottons until the end of the year. The following statement of cottons tested for the various Agricultural officers gives some idea of the work done in this direction —

(1) *The Cotton Breeder, Dhulia*—Four Khandesh cottons, of which three were new types, to be compared with N R cotton (*Gossypium neglectum*, Var *Roseum*)

(2) *The Cotton Breeder, Sind*—Four samples of American types

(3) *The Cotton Breeder, Surat*—Seven samples, three being new types under experimental cultivation, the others being controls.

(4) *The Cotton Breeder, Dharwar*—Five samples—Dharwar No 1, Gadag No 1, "Farm" Kumpta, and two new types.

(5) *Assistant Economic Botanist, Cawnpore*—Six samples of which four were new cottons, the other two samples being controls

(6) *Deputy Director of Agriculture, Aligarh, U. P.*—One sample of Aligarh white flower cotton

(7) *Economic Botanist, Central Provinces*—Three samples, two improved types being compared with a local *Roseum* control

(8) *Cotton Specialist, Madras*—Two samples one being a new strain of Cambodia cotton for comparison with the standard Co 1

(9) *Deputy Director of Agriculture, Bellary Madras*—Four samples two being new strains tested against local Mungari and Sircar 25 respectively as controls

(10) *Director of Agriculture, Punjab*—Fourteen samples, of which four were samples of 4F grown under different conditions and the remaining ten samples were the cottons 4F and 285F, with various admixtures of Desi cotton

(11) *Miscellaneous Tests*—Spinning tests have also been carried out (1) on Surat 1A cotton to determine how the behaviour of the lint from impure seed compared with that from pure farm seed, (2) on three Persian cottons

4. *Research Laboratory*.—The work in the Research Laboratory has been co-ordinated with that in the Spinning Laboratory. Determinations of staple length and of the distribution of staple length in any given sample are invariably carried out on every cotton submitted for test. These determinations are made by means of two instruments known respectively as the Balls Sorter and Baer Sorter, the results from the two instruments giving mutual checks. Measurements are also made by means of the microscope of the staple length, the fibre width, and the number and distribution of the natural twists in the cotton fibre known as convolutions. Additional tests on the raw material are being arranged for, such as the measurement of staple strength. The work in this direction will naturally expand now that the increased facilities of the new Research Laboratory are available. It is by the accumulation of the results of measurements of this kind and their subsequent statistical analysis that it is hoped to solve the problem as to the relation between the properties of a cotton and its spinning value. Another line of research is concerned with the investigation of the various yarn tests with a view to obtaining speedier testing without any sacrifice of accuracy. Some work in this direction has already been begun.

5. *Cotton Boll Weevil*.—During the present year the experimental work on the fumigation of American cotton was brought to a successful conclusion. A further practical experiment was carried out on a barge using a rubbered balloon fabric as a hatch cover. This effectually solved the previously encountered difficulty of preventing leakage of hydrocyanic acid gas from the hatch. After the hatch had been proved to be comparatively gas-tight a batch of 70 bales of American cotton was placed in the hatch for fumigation. It was then discovered that a great fall in concentration occurred immediately the charges of hydrocyanic acid gas were given. The results could only be explained by assigning an absorbent rôle to the bales of cotton. Experiments in charging and discharging the gas proved that not only did the bales absorb the gas readily, but that they also desorbed it equally readily. It was found that about one pound of sodium cyanide and a corresponding quantity of concentrated sulphuric acid were required for the fumigation of every three bales of cotton. This experiment showed conclusively that the fumigation of American cotton on barges was a practical possibility. As a direct consequence of this work, taken in conjunction with the experimental work in the Technological Laboratory, the Government of India was able to issue a notification under the Destructive Insects and Plant Diseases Act prohibiting the importation of American cotton except at the port of Bombay and except after fumigation at that port with hydrocyanic acid gas.

The experiments made at the Technological Laboratory itself were on two different scales. In one set of experiments were used a large wooden box having a capacity of 57 cubic feet, and, later, a cylindrical iron tank having a capacity of 66 cubic feet. By means of a chamber of this size the observations on the barge were confirmed on a single bale of cotton. The most useful piece of apparatus, however, was the small scale apparatus which was devised, using a large desiccator of some 10 litres capacity as the fumigating chamber. By the use of this apparatus a wide range of experiments was made possible from which the following conclusions were drawn —

(1) It is necessary to expose the grain weevil, Calandra, to an atmosphere containing about 150 parts of hydrocyanic acid gas per 100,000 parts of air for about 20 hours in order to ensure killing it outright.

(2) The actual lethal concentration and time of exposure for Calandra depend upon the temperature and possibly, to a much less extent, upon the humidity. When the temperature is above 85°F the weevils are much more easily killed. Thus, in a typical case, at $88^{\circ}\text{--}89^{\circ}\text{F}$ an exposure of 12 hours to a concentration of 140 parts per 100,000 sufficed to kill outright the 20 weevils used in the experiment, whereas at 82°F after an exposure of 16 hours to a similar concentration one out of 20 weevils subsequently revived, although this one also died some hours later. Very similar results both as to the concentration and time of exposure necessary, as well as the effect of temperature, have been obtained by the American authorities who have at our request repeated these experiments on the cotton boll weevil itself.

(3) Cotton, whether baled or in the loose state, rapidly absorbs a certain amount of hydrocyanic acid gas, and also rapidly desorbs it.

(4) Cotton which had been dried over concentrated sulphuric acid had a higher and more rapid absorptive power than cotton which had been placed in a moist atmosphere.

(5) The absorptive power of cotton remains practically unchanged throughout the range of temperature 86°F — 104°F .

(6) Jute—as used for gunny coverings of cotton bales—has a much higher and more rapid absorptive power than cotton.

(7) The absorptive power of jute is not greatly affected by its moisture content.

(8) The absorptive power of jute is practically independent of the temperature.

A full account of these fumigation experiments is in course of preparation.

APPENDIX I.

OPINIONS RECEIVED FROM THE BOMBAY MILLOWNERS' ASSOCIATION

I I have just been reviewing our cotton purchases for the year which is now ending and as we are often asked as to what effect the Cotton Transport Act has had, it will perhaps interest you to know that in 1924 we purchased for our mills something like four times the quantity of Compta cotton than we have done in

on
ly
is,

to
our
en
our

ota

ous

has

ind

ms
nce
ton
rict

APPENDIX I.

OPINIONS RECEIVED FROM THE BOMBAY MILLOWNERS' ASSOCIATION

I I have just been reviewing our cotton purchases for the year which is now ending and as we are often asked as to what effect the Cotton Transport Act has had, it will perhaps interest you to know that in 1924 we purchased for our mills something like four times the quantity of Compta cotton than we have done in any previous year, and this is entirely due to the fact that owing to the application of the Act, Compta cottons were better in class and staple and quality generally. The absence of mixed cotton, which had previously been tendered in Comptas, was remarkably noticeable, as we have never had to complain of mixed staple.

II Although we have our ginning factory in Hubli we still had occasion to buy about 2 000 bales in 1924 of Compta cotton in the Bombay market for our warp mixing and our experience was the same as the above. Had the cotton been of a mixed variety as before we would have refrained from buying locally for our warp mixing.

III I agree that there is a marked improvement in the quality of Compta cotton and most of the credit is due to the working of the Cotton Transport Act.

IV The Transport Act is a sound piece of legislation and has done enormous good to the Compta cotton.

V My experience is the same as that of the above gentlemen. The Act has proved a success.

VI I have also noticed a distinct improvement in the Compta cotton and I feel it is due to the new legislation.

VII My experience as a gin and press owner in the Surat district confirms the views expressed by the above gentlemen though for different reasons. Since the legislation, inferior cotton is not allowed to be transported to superior cotton centres and therefore superior cotton fetches its intrinsic value. In Surat district growers are now growing more superior cotton which is sold as farm cotton.

VIII Other members endorse the above remarks.

APPENDIX II.

COTTON TRANSPORT ACT IN MADRAS.

The original notification was approved by resolution passed by the Madras Legislative Council on the 26th of August, 1925, and amended on the 18th of November, 1925. The amended notification is given below :—

FORT ST. GEORGE, *November 18, 1925.*

(G.O. PRESS No. 1657, DEVELOPMENT.)

NOTIFICATION UNDER SECTION 3 OF THE COTTON TRANSPORT ACT, 1923 (III OF 1923), AS AMENDED BY ACT No. XXXIV OF 1925.

No. 344.—Whereas it is necessary for the purpose of maintaining the quality and reputation of the cotton grown in the areas in the Madras Presidency mentioned in Schedule I hereto appended.

Now, therefore, in exercise of the powers conferred by sub-section (1) of Section 3 of the Cotton Transport Act, 1923 (III of 1923), as amended by Act No. XXXIV of 1925, the Government of Madras are hereby pleased to prohibit the import of cotton into the said areas by rail and sea save under and in accordance with the conditions of a licence prescribed in this behalf, subject however to the exception specified in clause (3) below.

(2) The Government of Madras are further pleased to prohibit, under sub-section (2) of Section 3 of the said Act, the delivery to, and the taking of delivery by, any person, at any railway station situated in any of the protected areas and specified in Schedule II hereto appended, of any cotton when such cotton has been consigned from a railway station not situated in the said area unless such person holds the prescribed licence for the import of cotton into the said area, subject however to the exception specified in clause (3) below.

(3) The transport of cotton lint into Tiruppur-Cambodia protected area ^s defined in Schedule I from the districts of North Arcot, South Arcot, Chittoor and Chingleput and from the Atur, Dharmapuri, Hosur, Krishnagiri, Omalur, Salem and Uttangarai taluks of Salem district is exempted from the operation of clauses (1) and (2) and permitted without restriction.

SCHEDULE I—PROTECTED AREAS.

I. *The Northern and Western area.*—Consisting of the districts of Anantapur, Bellary, Cuddapah and Kurnool.

II. *The Tiruppur-Cambodia area.*—Consisting of the district of Coimbatore, the Karur, Musiri and Kulittalai taluks of Trichinopoly district, the Namakkal, Tiruchengodu and Rasipur taluks of Salem district and that portion of the Madura district lying to the north and west of the Vaigai River.

III. *The Tinnevely area.*—Consisting of the district of Tinnevely and that portion of the districts of Ramnad and Madura lying to the east and south of the Vaigai River.

SCHEDULE II—RAILWAY STATIONS

I *The Northern and Western area*—All stations from Kottur to Hospet both inclusive, from Rayadurg to Bellary both inclusive, from Hospet to Guntakal both inclusive, from Guntakal to Hindupur both inclusive, from Guntakal to Tungabhadra River both inclusive, from Dharmavaram to Tanakallu both inclusive, from Guntakal to Cumbum both inclusive on the Guntakal-Bezawada line, from Dhona to Kurnool both inclusive and from Guntakal to Settikunta both inclusive

II *The Tiruppur-Cambodia area*—All stations from Podanur to Kallar both inclusive, Madukarai and all stations from Podanur to Pollachi both inclusive, from Podanur to McDonald's Choultry both inclusive, from Madura bridge to Samudram both inclusive and from Erode to Marudur both inclusive.

III *The Tinnevely area*—All stations from Maniyachi to Madura both inclusive, from Maniyachi to Tenkasi both inclusive from Maniyachi to Tuticorin both inclusive, from Tinnevely to Tiruchendur both inclusive and from Madura to Mandapam both inclusive

RULES UNDER SECTION 7 OF THE COTTON TRANSPORT ACT, 1923
(III OF 1923) AS AMENDED BY ACT No XXXIV OF 1925.

No 345—In exercise of the powers conferred by Section 7 of the Cotton Transport Act, 1923 (III of 1923) as amended by Act No XXXIV of 1925, the Government of Madras are pleased to make the following rules to carry out the purposes of the said Act, namely —

(1) *Licensing authority form of application for a licence*—Licences for the import of cotton by rail and sea into the protected areas shall be granted by the Director of Agriculture, Madras Presidency or such other officer as may be authorized by him in this behalf, and application shall be made to that officer in Form A annexed to these rules

(2) No cotton of which the import has been prohibited by or under Section 3 of the Cotton Transport Act, 1923, as amended by Act No XXXIV of 1925, shall be imported into a prohibited area by sea save under and in accordance with the conditions of a licence issued as provided by these rules.

(3) *Licences for import of cotton for manufacture and export.*—

(i) Annual licences for import by rail shall be granted to manufacturers and exporters carrying on business within the protected area for the importation of cotton or of any specified kind of cotton from outside such area for manufacture and export to any port or ports outside India respectively. Such licences shall be in Form B hereto annexed and shall be subject to the conditions stated therein

(ii) A certified copy of such licences in Form C hereto annexed shall be tendered with each consignment at the despatching station and shall accompany the railway invoice to the station of delivery and shall then be forwarded by the railway authority concerned to the railway audit office for despatch to the Secretary, Indian Central Cotton Committee.

(iii) The licence shall be returned to the licensing authority at the expiration of the period for which it is granted together with all unused certified copies of the same.

(4) *Licence for particular consignment by rail.*—

(i) A single licence to cover only one consignment may be granted to such persons as can satisfy the licensing authority that it is necessary to import cotton or any specified kind of cotton (that is, cotton seed, kapas, ginned cotton or cotton waste) into the protected area. Such licences shall be in Form D hereto annexed and shall be subject to the conditions stated therein.

(ii) Such licence shall be surrendered at the station of delivery to the Station Master or other railway servant responsible for the receipt and delivery of goods and parcels at the time of taking delivery of the cotton covered by the licence who shall forward it to the licensing authority.

(iii) A certified copy of such licence in Form E hereto annexed shall be tendered with each consignment at the despatching station and shall accompany the railway invoice to the station of delivery and shall then be forwarded by the railway authority concerned to the railway audit office for despatch to the Secretary, Indian Central Cotton Committee.

(5) *Licence for particular consignment by sea.*—

(i) A single licence to cover only one consignment may be granted to such persons as can satisfy the licensing authority that it is necessary to import cotton or any specified kind of cotton (that is, cotton seed, kapas, ginned cotton or cotton waste) by sea into the protected area. Such licences shall be in Form F annexed and shall be subject to the conditions stated therein.

(ii) Such licence shall be delivered at the place specified by the licensing authority to the officer mentioned in the licence, who shall forward it to the licensing authority.

(6) *Separate licences to be issued for different kinds of cotton.*—Separate licences shall be issued for different kinds of cotton, that is to say, for ginned cotton, cotton seed, unginned cotton (kapas) and cotton waste.

(7) *Penalty.*—Any contravention of these rules or of the conditions of any licence granted hereunder, not otherwise punishable under the said Act, shall be punishable on conviction by a Magistrate with fine which may extend to five hundred rupees.

FORM A.

Application for Licence.

(See Rule 1.)

To

The Director of Agriculture,
Madras Presidency.

Sir,

I
We the undersigned hereby beg to apply for a licence
under the Cotton Transport Act, 1923 (Act III of 1923), as amended by Act

No XXXIV of 1925, available for the period of _____ to
 for the importation by rail of _____ bales of *
sea _____ maunds
 into the protected area known as _____
 notified in Government Notification, Development Department No 344, dated
 18th November, 1925, at _____ station for the purpose of

I
we so beg to apply for a certified copy of the licence (as required by the said
 Act)

2 I
we declare that such cotton
kapas is required for the purpose of
cotton seed
waste
 only and will not be otherwise used save under the instructions of the licensing
 authority

Reasons why importation is necessary (a)

3 I
we undertake —

(1) in the event of the cotton
kapas imported under the said licence
cotton seed
waste
 proving unsuitable for the purpose for which it is imported to report the matter
 to the licensing authority and to await his approval to its disposal otherwise before
 allowing such cotton
kapas to leave my premises,
cotton seed
waste our

(2) that under no circumstances will I
we allow cotton
kapas imported under
cotton seed
waste
 the said licence to be used for mixing with or adulteration of cotton
kapas
cotton seed
waste
 produced in the protected area for re-export nor will I
we allow it to be re-exported
 under a misdescription,

(3) to return the said licence on expiration of the period for which it is granted
 to the licensing authority together with such details as he may require as to the
cotton
kapas imported under it and of its subsequent disposal
cotton seed
waste

Dated
 at

(Signed)

* State whether ginned cotton unginned cotton (kapas), cotton seed or cotton
 waste

(a) Reasons should be clearly stated as licences are only issued in cases of
 proved necessity In the case of applications for licences to import by sea, the
 form should be modified as may be necessary.

INSTRUCTIONS.

(a) The Cotton Transport Act does not impose any general restriction on cotton transport but only on transport into specified areas (notified by Local Governments for protection) by rail, road, river and sea or by one or more of such routes. The notifications issued by the Government of Madras only prohibit transport by rail and sea and not transport by road and river. Each notification includes a schedule of railway stations in the protected area to which it refers. Licences are only required by concerns situated within the limits of a protected area. Licences granted under the Cotton Transport Act are available for the importation of cotton from anywhere in India but only to the stations specified.

(b) Cotton, as defined in the Act, includes ginned cotton, unginned cotton (kapas), cotton seed and cotton waste, but separate licences are required for each. Separate rules are also in force for the importation into protected areas of cotton by sea.

(c) Station Masters or other railway servants responsible for the booking of goods or parcels at all stations in India are *empowered* by Section 4 of the Act to refuse to book cotton to a notified station in a protected area unless a certified copy of the licence is handed in when the cotton is tendered for booking. Each consignment requires a separate certified copy which will accompany the railway invoice to destination.

(d) Station Masters or other railway servants responsible for the receipt and delivery to the consignee of goods and parcels at notified stations are *required* by Section 5 of the Act to refuse delivery of cotton from outside the protected area (which is defined by a list of stations) unless accompanied by a certified copy of the licence (or unless the original licence is produced).

(e) Paragraph 2 in the application form corresponds with condition (b) of the licence, the object being to safeguard the protected area against the misuse (which might be quite unintentional) of cotton imported under licence.

(f) The protected areas notified in the Madras Presidency are those contained in Government Notification, Development Department, No. 344, dated 18th November, 1925.

FORM B.

Annual General Licence (for Manufacturers and Exporters).

(See Rule 3.)

No. of 192 .

Under the Cotton Transport Act, 1923 (Act III of 1923), as amended by Act No. XXXIV of 1925, the Mills Company carrying

on business within the protected area known as _____ notified
in Government Notification, Development Department, No. 344, dated 18th
November, 1925, are hereby granted a general licence under Section 3
of the said Act for the period February 1, 192_____, to January 31, 192_____,
to import by rail _____ bales of * _____ to

station for the purpose of $\frac{\text{maunds}}{\text{export to any port or ports outside India}} \frac{\text{manufacture}}{\text{subject to the following conditions :—}}$

*Here enter ginned cotton, cotton waste, kapas or cotton seed for which licence is granted.

(a) A certified copy of this licence shall be tendered with the consignment at the despatching station.

(b) Cotton imported under this licence shall not be used except for the purpose stated above, save under the instructions of the licensing authority.

(Signed)

Licensing Authority.

Dated 192 .

This certified copy should accompany the invoice to the railway audit office and should be despatched from there to the Secretary, Indian Central Cotton Committee, Bombay.

FORM C.

Certified copy of General Licences (for Manufacturers and Exporters) to be tendered at Despatching Stations

(See Rule 3.)

Licence No. 192 . Copy No.

Under the Cotton Transport Act, 1923 (Act III of 1923), as amended by Act No. XXXIV of 1925, the ^{Mills}
Company carrying on business within the protected area known as notified in Government Notification, Development Department, No 344, dated 18th November, 1925, are hereby granted a general licence under Section 3 of the said Act for the period February 1, 192 , to January 31, 192 , to import by rail ^{bales}
maunds of * to station for the purpose of ^{manufacture}
export to any port or ports outside India subject to the following conditions —

(a) A certified copy of this licence shall be tendered with the consignment at the despatching station.

(b) Cotton imported under this licence shall not be used except for the purposes stated above, save under the instructions of the licensing authority.

(Signed)

Licensing Authority:

Name of Consignor

Number of bales

Description of cotton

Signature of Consignor.

Signature of Station Master.

Dated 192 .

FORM D.

Single Licence for Consignment by Rail.

(See Rule 4.)

Under the Cotton Transport Act, 1923 (Act III of 1923), as amended by Act No. XXXIV of 1925, ^{Messrs}
Mr granted a licence to import to station situated in the protected area known

* Here enter article.

as notified in Government Notification, Development Department,
No. 344, dated 18th November, 1925, $\frac{\text{bales}}{\text{maunds}}$ of * from
(station) for the purpose of

This licence is only valid for one consignment and shall be surrendered to the undersigned, duly endorsed by the Station Master of the station of delivery or other railway servant responsible for the receipt and delivery of goods and parcels at the station on the arrival of the consignment :—

(a) A certified copy of this licence shall be tendered with the consignment at the despatching station.

(b) Cotton imported under this licence shall not be used except for the purposes stated above, save under the instructions of the licensing authority.

(Signed)

Licensing Authority.

Dated 192 .

This certified copy should accompany the invoice to the railway audit office and should be despatched from there to the Secretary, Indian Central Cotton Committee, Bombay.

FORM E.

Certified copy of Single Licence in Form D.

(See Rule 4.)

Licence No. of

Under the Cotton Transport Act, 1923 (Act III of 1923), as amended by Act No. XXXIV of 1925, $\frac{\text{Messrs.}}{\text{Mr.}}$ $\frac{\text{are}}{\text{is}}$ granted a licence to import to (station) situated in the protected area known as notified in Government Notification, Development Department, No. 344, dated 18th November, 1925, $\frac{\text{bales}}{\text{maunds}}$ of * from (station) for the purpose of

This licence is only valid for one consignment and shall be surrendered to the undersigned, duly endorsed by the Station Master of the station of delivery or other railway servant responsible for the receipt and delivery of goods and parcels at the station on the arrival of the consignment :—

(a) A certified copy of this licence shall be tendered with the consignment at the despatching station.

(b) Cotton imported under this licence shall not be used except for the purposes stated above, save under the instructions of the licensing authority.

(Signed)

Licensing Authority.

Name of Consignor
Number of bales
Description of cotton

Signature of the Consignor.
Signature of the Station Master.

Dated 192 .

* State whether ginned cotton, cotton waste, kapas or cotton seed.

FORM F.

Single Licence for Consignment by Sea

(See Rule 5)

Under the Cotton Transport Act, 1923, as amended by Act No XXXIV of 1925, ^{Messrs.}~~Mr~~ ^{are}~~is~~ granted a licence to import to
 situated in the protected area known as notified in Govern-
 ment Notification, Development Department, No 344, dated 18th November, 1925,
^{bales}~~maunds~~ Of from for the purpose of

*This licence is only valid for one consignment and shall be surrendered to the
 officer in charge of the at on the arrival of the
 consignment :—*

Cotton imported under this licence shall not be used except for the purposes
 stated above, save under the instructions of the licensing authority.

(Signed)

Licensing Authority

APPENDIX III.

The following Act of the Indian Legislature received the assent of the Governor-General on the 18th March, 1925, and is hereby promulgated for general information :—

ACT No. XII OF 1925.

An Act to provide for the better regulation of Cotton Ginning and Cotton Pressing Factories.

Whereas it is expedient to provide for the better regulation of cotton ginning and cotton pressing factories ; It is hereby enacted as follows :—

Short title, extent and commencement.

1. (1) This Act may be called the Cotton Ginning and Pressing Factories Act, 1925.

(2) It extends to the whole of British India (except Burma), including British Baluchistan and the Sonthal Parganas.

(3) It shall come into force on such date as the Governor-General in Council may, by notification in the *Gazette of India*, appoint.

2. In this Act, unless there is anything repugnant in the subject or context,—

Definitions.

(a) “ bale ” means any pressed package of cotton of whatever size or density ;

(b) “ cotton ” means ginned or unginned cotton, or cotton waste ;

(c) “ cotton ginning factory ” means any place where cotton is ginned or where cotton fibre is separated from cotton seed by any process whatever involving the use of steam, water or other mechanical power or of electrical power ;

(d) “ cotton pressing factory ” means any factory as defined in the Indian **XII of 1911.** Factories Act, 1911, in which cotton is pressed into bales ;

(e) “ cotton waste ” means droppings, strippings, fly and other waste products of a cotton mill or of a cotton ginning factory or of a cotton pressing factory, but does not include yarn waste ;

(f) “ Indian Central Cotton Committee ” means the Indian Central Cotton **XIV of 1923.** Committee constituted under the Indian Cotton Cess Act, 1923, and includes any sub-committee appointed by it to perform any function of the Indian Central Cotton Committee under this Act ; and

(g) “ occupier ” includes a managing agent or other person authorised to represent the occupier ;

(h) “ prescribed ” means prescribed by or under rules made under this Act.

3. (1) The owner of every cotton ginning factory shall cause to be maintained at the factory in such form, if any, as may be prescribed, a ginning register containing a record of all cotton ginned in the factory and of the names of the persons for whom and the dates on which the cotton has been ginned and of the amount ginned for each person.

Maintenance of registers.

(2) The owner of every cotton pressing factory shall cause to be maintained at the factory in such form, if any, as may be prescribed, a press register containing a daily record of the number of bales pressed in the factory, the serial number of each bale, and the name of the person for whom it has been pressed

(3) The owner or the person in charge of a cotton ginning or cotton pressing factory shall be bound to produce any ginning register or press register maintained under this section when required to do so by any person appointed by the Local Government in this behalf, and the owner or person in charge of any cotton pressing factory shall be bound to furnish to the Indian Central Cotton Committee, if so required by it in writing, a copy, certified as correct by the owner or person in charge of the factory, of the entry in any press register maintained at the factory relating to any specified bale.

(4) No register required to be maintained by this section shall be destroyed until after the expiration of three years from the date of the last entry therein

(5) If—

(a) in any factory any register required by this section to be maintained is not maintained or is maintained in any form other than the form, if any, prescribed for the purpose, or

(b) any entry in any such register is proved to be false in any material particular, or

(c) any such register is destroyed before the expiration of the period referred to in sub-section (4),

the owner of the factory shall be punished with fine which may extend to fifty rupees or, if he has previously been convicted of any offence under this sub-section, to five hundred rupees

(6) If the owner or the person in charge of any factory fails to produce any register, or to furnish a certified copy of any entry, when required to do so under sub-section (3), or furnishes a certified copy of an entry knowing or having reason to believe such copy to be false, he shall be punished with fine which may extend to fifty rupees or, if he has previously been convicted of any offence under this sub-section, to five hundred rupees

4 (1) The owner of every cotton pressing factory shall cause every bale pressed in the factory to be marked in such manner as may be prescribed, before it is removed from the press-house, with a serial number and with the mark prescribed for the factory.

(2) If any bale is removed from the press-house of any cotton pressing factory without having been marked as required by sub-section (1), the owner of the factory shall be punished with fine which may extend to fifty rupees.

5 (1) The owner of every cotton pressing factory shall submit to the prescribed authority, within such time and in such form as may be prescribed, weekly returns showing the total number of bales of cotton pressed during the preceding week and from the commencement of the season to the end of that week, and the approximate average net weight of the bales pressed in that week.

• Returns

(2) The Local Government shall compile from the weekly returns, and shall publish in such manner as the Governor-General in Council may direct, a statement showing the total number of bales pressed in the province during the week and from the commencement of the season to the end of the week, to which the returns relate :

Provided that the number of bales pressed in any individual factory shall not be published.

(3) If default is made in submitting any return as required by sub-section (1), the owner of the factory shall be punished with fine which may extend to fifty rupees.

(4) Where the owner of a cotton pressing factory has notified to the prescribed authority that the work of pressing bales in that factory has been suspended, it shall not be necessary for the owner to submit returns under sub-section (1) until such work has been resumed.

Explanation.—In this section “season” means the period notified in this behalf by the Local Government in the local official *Gazette*.

6. (1) No scales or weights shall be used in any cotton ginning or cotton pressing factory other than the scales or weights, if any, prescribed by the Local Government as standard for the district in which the factory is situated.

Scales and weights.

(2) If in any factory any scale or weight is used in contravention of the provisions of sub-section (1), the owner of the factory shall be punished with fine which may extend to fifty rupees, or if he has been previously convicted of any offence under this sub-section, to five hundred rupees.

7. (1) Where the owner of a cotton ginning or pressing factory has leased the factory for a period of not less than one month, in the case of a cotton ginning factory, or three months, in the case of a cotton pressing factory, and the lessor retains no interest in the management or profits of the factory and notice of the lease has been given by the lessor and the lessee to the prescribed authority, the lessee shall be deemed to be the owner of the factory, from the date of the notice and for the period of the continuance of the lease, for the purposes of Section 3, in respect of the registers maintained or to be maintained from that date and for that period, and for the purposes of Sections 4, 5 and 6.

Liability of lessee as owner.

(2) On the termination of the lease the lessee shall hand over to the lessor the registers maintained under Section 3, and the lessor shall forthwith report to the prescribed authority any default of the lessee in complying with the provisions of this sub-section or in maintaining the registers in accordance with the provisions of Section 3.

(3) If default is made in handing over any register or making any report as required by this section, the lessor or the lessee, as the case may be, shall be punished with fine which may extend to fifty rupees.

8 (1) On a transfer of the ownership of a cotton ginning or pressing factory the transferor shall hand over to the transferee the registers maintained under Section 3 and the transferee shall forthwith report to the prescribed authority any default of the transferor in complying with the provisions of this sub-section or in maintaining the registers in accordance with the provisions of Section 3

Liability on transfer of ownership

(2) If default is made in handing over any register or making any report as required by sub-section (1) the transferor or the transferee as the case may be, shall be punished with fine which may extend to fifty rupees

9 (1) In the case of cotton ginning factories the construction of which is commenced after the commencement of this Act —

Structural requirements for factories

(a) gin houses shall be provided with separate entrances and exits for the bringing in of unginned and the taking out of ginned cotton respectively and

(b) the factories shall be constructed in accordance with plans and specifications approved by the prescribed authority

Provided that nothing in this sub-section shall apply to any factory in which only roller gins are used where the number of such gins is not more than four

(2) Within such period after the commencement of this Act as may be prescribed the owner of every cotton pressing factory in which cotton is handled on the ground floor shall cause the press house to be paved or provided with other suitable flooring to the satisfaction of the prescribed authority

(3) If the owner of any factory fails to comply with any provision of this section which is applicable to the factory he shall be punished with fine which may extend to one hundred rupees

(4) (a) Where the owner of a factory has been convicted under sub-section (3), the prescribed authority may serve on the owner of the factory an order in writing directing that such alterations shall be made in the factory before a specified date as in the opinion of the said authority are necessary to secure compliance with the provisions of sub-section (1) or sub-section (2) as the case may be

(b) Where the alterations are not made in accordance with the order served under clause (a) of this sub-section the prescribed authority may serve on the owner and on the occupier if any of the factory an order in writing directing that the work of ginning or pressing cotton in such factory shall be suspended until the alterations have been made in accordance with the order served under clause (a) of this sub-section and the owner and the occupier if any shall be jointly and severally liable to fine which may extend to fifty rupees for each day on which cotton is ginned or pressed in the factory in contravention of the order served under this clause

10 Where the person guilty of an offence under this Act is a company every director manager secretary and other officer thereof who is knowingly a party to the default shall also be guilty of the like offence and liable to the like punishment

Liability of officers of a company

11. (1) No prosecution under this Act shall be instituted except by or with the previous sanction of the District Magistrate or a Chief Presidency Magistrate or a Magistrate of the first class specially empowered in this behalf by the Local Government.

(2) No offence punishable under this Act shall be tried by any Court inferior to that of a Presidency Magistrate or of a Magistrate of the first class.

Power of the Governor-General in Council to make rules, 12. The Governor-General in Council may make rules to provide for :—

(a) the allotment of a special mark to be used by each pressing factory for the purpose of the marking of bales ; .

(b) the manner in which bales shall be marked ; and

(c) the manner in which the weekly statements referred to in Section 5 shall be published.

Power of the Local Government to make rules. 13. The Local Government may, by notification in the local official Gazette, make rules consistent with this Act to provide for all or any of the following matters, namely :—

(a) the forms in which registers, records and returns are to be maintained or submitted, and the inspection of records and registers ;

(b) the appointment of the authority to whom and the time within which the returns required by Section 5 shall be made ;

(c) the weights and scales to be used in cotton ginning and cotton pressing factories in any district in the province, and the inspection of the same ;

(d) the appointment of authorities for the purposes of Sections 7, 8 and 9 ;

(e) the manner of service of orders made under Section 9 ;

(f) the powers of entry and inspection which may be exercised by District Magistrates or by any officer specially empowered in this behalf by the Local Government ;

(g) any other matter which is to be or may be prescribed or for which provision is necessary in order to carry out the purposes of this Act.

Power to reject unmarked bales in fulfilment of contracts. 14. After the expiration of one year from the commencement of this Act any person who has made a contract for the purchase of baled cotton may require that no bales other than bales marked in accordance with Section 4 shall be supplied in fulfilment of such contract, and, if he does so require, no bale not so marked shall be tenderable in fulfilment of the contract :

Provided that nothing in this section shall apply to a contract for the sale and delivery of cotton grown before, or less than one year after, the commencement of this Act.

Protection for acts done under Act, 15. No suit or other legal proceeding shall be instituted against any person in respect of anything which is in good faith done or intended to be done under this Act.

DEPARTMENT OF COMMERCE,
NOTIFICATION,

COMMERCE,

SIMLA, the 8th August, 1925.

No 236-C. (2) In pursuance of sub section (3) of Section 1 of the Cotton Ginning and Pressing Factories Act, 1925 (XII of 1925), the Governor-General in Council is pleased to appoint the 8th August, 1925, as the date on which the said Act shall come into force

No. 236 C (2) In exercise of the power conferred by Section 12 of the Cotton Ginning and Pressing Factories Act, 1925 (XII of 1925), the Governor-General in Council is pleased to make the following rules—

Short title and commencement 1 (1) These rules may be called the Indian Cotton Ginning and Pressing Factories Rules, 1925.

(2) They shall come into force on the eighth day of August, 1925.

2 In these rules—

Definition "Act" means the Cotton Ginning and Pressing Factories Act, 1925.

"Section" means a section of the Act.

3 The owner or lessee of every cotton pressing factory shall apply to the authority appointed to receive returns under sub section (1) of Section 5 for the allotment of the mark required by Section 4 to be used for such factory. Such application shall be made, in the case of factories in existence at the commencement of these rules, on or before the 1st September, 1925 and in case of factories constructed thereafter, not less than one month before work commences in the factory :

Provided that the authority aforesaid may at any time allot the mark to be used in a factory in respect of which no application has been made and may intimate the allotment to the owner of such factory

Special mark 4 (1) The special mark allotted to each factory shall consist of a letter denoting the province in which the factory is situated together with a number denoting the factory.

(2) The letters denoting the province shall be as follows :—

For presses situated in the Madras Presidency the letter	..	..	M.
For presses situated in the Bombay Presidency, excluding Sind, the letter	..	..	B.
For presses situated in Sind the letter	..	..	S
For presses situated in Bengal the letter	..	..	L
For presses situated in the United Provinces the letter	..	..	U.
For presses situated in the Punjab the letter	..	..	P.
For presses situated in the Central Provinces the letter	..	..	Q.
For presses situated in Bihar and Orissa the letter	..	..	C.
For presses situated in Assam the letter	..	..	A.

For presses situated in the North-West Frontier Province the letter . . F
 For presses situated in Ajmer-Merwara the letter J.
 For presses situated in Delhi the letter D.

(3) The numbers denoting the factory shall run consecutively within each province.

Marks not transferable. 5. No special mark once allotted shall be transferred to another factory :

Provided that when a press is transferred from one province to another the original allotted mark shall no longer be used and application shall be made to the prescribed authority for the allotment of a fresh mark.

6. The serial number shall consist of two parts. The first part shall consist of two numerals being the last two integers of the calendar year in which the cotton year has commenced and the second part shall be the running number of the bale according to the press factory register. A new series of running numbers shall be started at the commencement of each cotton year. The cotton year shall commence on the 1st day of September in each calendar year and shall terminate on the thirty-first day of August next following, except in the Madras Presidency where the dates for the commencement and ending of the cotton year shall be the first day of February and the 31st day of January respectively.

7. On and after the 1st October, 1925, every bale of cotton pressed in a cotton pressing factory shall be marked in the following manner :—

Manner of marking. The special mark and the two integers denoting the cotton year shall be indelibly punched or stamped on any part of the central hoop of the bale in such a manner as to be clearly decipherable. Provided that if the bale is lashed with less than three hoops the marks shall be punched on either of the hoops (if two hoops be used) or near the middle of the hoop if one hoop only be used. The letters and numbers used shall in no case be less than one-quarter-of-an-inch in length ; English letters and numbers only shall be used.

The running number of the bale shall be punched or stamped on the hoop as described above or shall be stencilled in ink on the hessian covering of a lashed flat side of the bale in such a manner as to be clearly decipherable, English numbers only being used which shall not be less than two inches in length.

The following order shall be observed for marks punched on the hoops :—

Number denoting factory—letter denoting province—numerals denoting cotton year.

If the running number be punched on the hoop it shall follow the second of the two numbers denoting the cotton year and separated from it by a star. Where the running number is stencilled on the hessian a star shall be placed before the first integer and after the last integer.

Illustration

A bale of cotton pressed at a factory in the Bombay Presidency in February 1926 would be marked in either of the following ways —

On the hoop		On the hoop	On the hessian
1		1	*
6		6	J
1		1	4
B	or	B	5
2		2	,
5		5	*
*			
3			
4			
5			
6			

In this mark 161B is the factory mark B denoting the province and 161 the number allotted to the factory, 25*3456 is the serial number 25 denoting the cotton year commencing on September 1st 1925 and 3456 the running number of the bale pressed in the factory

Note

(1) In order to reduce to the minimum any risk of weakening the hoops by the punching or stamping of marks it is advisable to place the numbers and letters as in diagram (a) and not as in diagram (b)

Diagram (a)

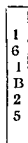
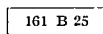


Diagram (b)



(11) The stencilling of the running number on an end or unlashed side of a bale does not fulfil the requirements of this rule

8 The statements to be compiled by Local Governments under sub section (2) of Section 5 shall be published weekly in the local official *Gazette* and in the supplement to the *Gazette of India* in the form appointed for the province concerned in the annexed Schedule.

Compilation and publication of returns

SCHEDULE.

FORM A.—MADRAS.

Statement of cotton pressed in the Madras Presidency for the week ending . 19 .

[Section 5 (2) of the Cotton Ginning and Pressing Factories Act, 1925.]

I		2	3	4	5
Variety of cotton.		No. OF BALES PRESSED.		No. OF BALES PRESSED.	
		During the week.	During the corresponding week last year.	Since.....19 . (The date prescribed by the Local Government as the commencement of the season.)	During the corresponding period last year.
1.	Tinnevellies	..	..
2.	Salems	..	..
3.	Cambodia..	..	..
4.	Northerns and Westerns	..			
5.	Coconadas	..	..
	TOTAL..				

(Columns 3 and 5 to be filled in after September 1st, 1926.)

FORM B.--BOMBAY.

Statement of cotton pressed in the Bombay Presidency for the week ending

19

[Section 5 (2) of the Cotton Ginning and Pressing Factories Act, 1925.]

1	2	3	4	5	6
Name of Division or Block.	No. OF BALES PRESSED.		No. OF BALES PRESSED.		Districts included in the block.
	During the week.	During the corresponding week last year.	Since.....19 (The date pre- scribed by the Local Govern- ment as the commencement of the season)	During the corresponding period last year.	
1 The Konkan and the Port of Bombay.					Thana, Kolaba and the Is- land of Bombay.
2. Gujerat					Ahmedabad, Kaira, Broach, Panch Mahals and Surat.
3. North Deccan ..					East Khandesh, West Khan- desh and Nasik.
4. East Deccan ..					Ahmednagar, Sholapur and Byapur.
5. West Deccan and Southern Mahratta Country					{ Poona, Satara and Ratna- giri.
6. Sind					{ Belgaum, Dharwar, Kanara All districts in Sind.
Total for the Presidency excluding the Konkan and Port ..					NOTE—Cotton pressed in the Konkan and Port block is mainly re-pressed cotton or cotton waste.

(Columns 3 and 5 to be filled in after September 1st, 1926.)

FORM F.—CENTRAL PROVINCES.

Statement of cotton pressed in the Central Provinces for the week ending

19

[Section 5 (2) of the Cotton Ginning and Pressing Factories Act, 1925.]

1	2	3	4	5	6
Name of Division or Block	NO OF BALES PRESSED.		NO. OF BALES PRESSED.		Districts included in the block.
	During the week	During the corresponding week last year	Since.....19 (The date prescribed by the Local Government as the commencement of the season.)	During the corresponding period last year	
1. Jabulpore				Jabulpore, Saugor, Damoh
2. Nerbudda				Narsinghpur, Hoshangabad,
3. Nimar				Nimar.
4. Nagpur				Nagpur, Chanda, Bhandara, Wardha, Balaghat.
5. Satpura				Seoni, Chhindwara, Betul, Mandla
6. Chhatisgarh..	..				Drug, Raipur, Bilaspur.
TOTAL ..					

(Columns 3 and 5 to be filled in after September 1st, 1926)

FORM G.—BIHAR AND ORISSA.

Statement of cotton pressed in the Province of Bihar and Orissa during the week ending—19 .

[Section 5 (2) of the Cotton Ginning and Pressing Factories Act, 1925.]

I	2	3	4	5	6
Name of Division or Block.	No. of Bales Pressed.		No. of Bales Pressed.		Districts included in the block.
	During the week.	During the corresponding week last year.	Since. ....19 . (The date pre- scribed by the Local Govern- ment as the commencement of the season.)	During the corresponding period last year.	
The Province of Bihar and Orissa.					All districts in the Province.

(Columns 3 and 5 to be filled in after September 1st, 1926.)

Statement of cotton pressed in the Province of Assam during the week ending

61

[Section 5 (2) of the Cotton Ginning and Pressing Factories Act, 1925.]

1	2	3	4	5
Name of Division or Block	No. OF BALES PRESSED		No. OF BALES PRESSED.	
	During the week.	During the corresponding week last year	Since .....19 (The date prescribed by the Local Government as the commencement of the season.)	During the corresponding period last year
Districts included in the block.				
The Province of Assam..				All districts in Assam.

(Columns 3 and 5 to be filled in after September 1st, 1926.)

FORM I.—NORTH-WEST FRONTIER PROVINCE.

Statement of cotton pressed in the North-West Frontier Province during the week ending 19 .

[Section 5 (2) of the Cotton Ginning and Pressing Factories Act, 1925.]

1	2	3	4	5	6
Name of Division or Block.	No. of BALES PRESSED.		No. of BALES PRESSED.		Districts included in the block:
	During the week.	During the corresponding week last year.	Since.....19 . (The date pre- scribed by the Local Govern- ment as the commencement of the season.)	During the corresponding period last year.	
The North-West Fron- tier Province.					All districts in the Province.

(Columns 3 and 5 to be filled in after September 1st, 1926.)

FORM J.--AJMER-MERWARA

19

Statement of cotton pressed in the Ajmer-Merwara during the week ending

[Section 5 (2) of the Cotton Ginning and Pressing Factories Act, 1925.]

	2	3	4	5	6
Name of Division or Block	No. OF BALES PRESSED.		No. OF BALES PRESSED.		Districts included in the block.
	During the week	During the corresponding week last year	Since.....19 (The date prescribed by the Local Government as the commencement of the season)	During the corresponding period last year.	
Ajmer-Merwara					The whole of Ajmer-Merwara.

(Columns 3 and 5 to be filled in after September 1st, 1926)

FORM K.—DELHI.

Statement of cotton pressed in Delhi for the week ending 19 .

[Section 5 (2) of the Cotton Ginning and Pressing Factories Act, 1925.]

1	2	3	4	5	6
Name of Division or Block.	No. OF BALES PRESSED.		No. OF BALES PRESSED.	Districts included in the block.	
	During the week.	During the corresponding week last year.	Since.....19 . (The date pre- scribed by the Local Govern- ment as the commencement of the season.)		
	During the corresponding period last year.				
The Delhi Province ..					The whole of Delhi Province.

(Columns 3 and 5 to be filled in after September 1st, 1926.)

APPENDIX IV.

THE BILL FOR THE REGULATION OF GINS AND PRESSES.

WHY IT IS WANTED.

WHAT IT REQUIRES THE PRESS OWNER TO DO.

HOW IT WILL HELP THE CULTIVATOR.

This Bill is frankly an attempt to prevent, or at any rate reduce the adulteration of good cotton by bad and is a necessary complement to the Cotton Transport Act passed in 1923. The evils of mixing are well recognised and for years a remedy has been sought. The justification for legislation is that grave economic loss to the whole country is being caused and that the loss is falling most heavily on the cotton grower who is least able to protect himself. It must be remembered that the Indian cotton crop now averages some 50 lakhs of bales (worth over 100 crores of rupees) of which Indian mills take about 20 lakhs of bales, the balance being exported. A few recent instances will show the extent of the loss caused by mixing.

The Agricultural Department in the Punjab has successfully established the growing of Punjab-American cotton on some six lakhs of acres. Last year it was calculated that this brought in *at least* 120 lakhs of rupees of extra profit to the grower. But Indian mills have constantly complained that the cotton is mixed and consequently cannot be used for the purpose for which cotton of one inch staple should be suitable.

At the commencement of the season the demand for cotton of the 1923-24 crop was keen and both Indian mills and exporters paid high prices for it. Later deliveries were badly mixed, the reputation of Punjab-American was lowered and its price relative to other cottons fell heavily as will be seen from the following Bombay prices :—

Date.	Spot prices of Punjab-American Rs per khandy		Broach Quotation, Rs per khandy	Premium on Broach, Rs per khandy
	High.	Low.		
February 11th.. ..	755	735	665—635	Rs. 90 to Rs. 100.
March 1st	670	650	585—580	Rs. 85 to Rs. 70.
April 7th	680	660	605—585	Rs. 75.
May 5th	670	650	600—580	Rs 70.
June 9th	685	650	625—610	Rs 60 to Rs. 40.
July 7th	650	615	585—575	Rs. 65 to Rs. 40.
August 4th	640	620	595—585	Rs 45 to Rs. 35.
September 16th	620	600	585—565	Rs. 35.
October 13th	565	540	540—520	Rs 25 to Rs 20.
November 1st	530	510	510—500	Rs 20 to Rs. 10.

A similar fall took place on the Liverpool market where a fair amount of Punjab-American was sold in the early part of 1924. Early in 1924 Punjab-American was sold at $\frac{1}{4}d.$ per lb. *above* current quotations for Middling American. Later, as the result of complaints of mixed cotton being delivered, prices even for the best fell to $1\frac{1}{2}d.$ per lb. *below* Middling American ; a fall in price equal to Rs. 80 per Bombay khandy.

When these figures are translated into terms of unginned cotton they represent Rs. 2-8 per maund or, say, Rs. 17-8 per acre. The effect on the cultivator's profit is obvious.

MIXING NOT DONE BY THE GROWER.

Very careful and thorough enquiry has been made as to where the mixing takes place and a number of independent reports received. Despite the fact that the same cultivators grow both American and Desi cottons in the Punjab, the American *kapas* brought to market by them is on an average of 95 per cent. or greater purity. The baled cotton which is exported from the Punjab is often only 75 per cent. pure. The mixing is done *after* the cultivator has sold his cotton and mainly in the ginning and pressing factories.

Other outstanding instances which can be quoted are the mixing of inferior cottons with Cambodia at Tiruppur and of short-staple cotton with the best Madras Northerns at Nandyal.

WHAT THE FACTORY OWNER IS ASKED TO DO.

If the Bill becomes law every owner of a pressing factory will have to—

- (1) have all bales marked in a prescribed manner ;
- (2) have records maintained of all bales pressed and for whom pressed
- (3) every gin owner will be required to maintain a record of all cotton ginned and for whom ginned. Both will be required to produce copies of their records if called upon to do so by the Local Government or the Indian Central Cotton Committee.

The additional requirements are :—

- (1) That all pressing factories shall submit periodical returns of the number of bales pressed.
- (2) In ginning and pressing factories only recognised weights shall be used.
- (3) New factories shall comply with certain structural requirements.

Most good factory owners and merchants, whose work is properly organised, comply with most of these requirements already.

(1) The marking of bales with a mark identifying the press means no hardship. Most presses put on their own mark already. A uniform system of permanent marking, however, is needed. The present marks on the *ends* of bales are often useless.

(2) Most presses already maintain records of all cotton pressed specially when they press for more than one client.

(3) Periodical (weekly) statistical returns are at present supplied voluntarily by all presses in Madras. A voluntary system was tried in other provinces, and no objections were raised, but the returns were too incomplete to be of value. All spinning mills are required by law to make a return every month of the quantity of yarn produced and there is no reason why cotton presses should not furnish returns of cotton baled which are essential to the proper maintenance of cotton statistics.

RECOGNISED WEIGHTS

Here again the majority of ginning factories do this already. In many cotton markets the actual weighment is done in the ginning factories and the cultivator is clearly entitled to honest weighment.

STRUCTURAL REQUIREMENTS FOR NEW FACTORIES

A large number of ginning factories are well designed and well constructed. Others are so faulty that the cotton ginned in them is seriously damaged. The provision that all future factories shall conform to a reasonable minimum standard is not only no hardship but to everybody's interest.

It is clear that there is nothing that the honest press owner need fear in these conditions.

WHY THE FACTORY OWNER SHOULD BE HELD RESPONSIBLE.

There are many that admit that undesirable practices are going on but argue that the factory owner only works on commission and is in the hands of his clients. This is only partly true for it is well known that—

- (1) in some districts where certain abuses are very prevalent the factory owners themselves are big buyers of *kapas* and sellers of cotton.
- (2) Factory managers know quite well when malpractices are going on. In many presses there are special rates for pressing mixed cotton.
- (3) Some pressing factories have actually installed machines to facilitate mixing.

Moreover, the record of ownership of the cotton enables the press owner at once to pass on the responsibility to the merchant for whom he presses if he has himself worked in good faith.

HOW THE PROPOSED ACT WOULD HELP THE GROWER

The introduction of a system of marking of bales and maintenance of records will put the merchant or spinner in a position to protect himself. This will lead to greater confidence in buying and thus to higher prices to the grower. We have an excellent example of how the cultivator has benefited by the stopping of abuse in the application of the Cotton Transport Act in Bombay. It is well known that the quality of Surat, Kumpta and Dharwar cottons has gone up enormously since the importation of short-staple cotton by rail and sea for mixing purposes was stopped. The prices for the cotton and *kapas* of these areas relative to other cottons rose considerably and the cultivator gained.

It has already been stated that this Bill is a necessary complement to the Cotton Transport Act, and the reasons are obvious. In the first place, the Bill now proposed is made general in its application for there are many abuses prevalent in ginning and pressing factories with which the Cotton Transport Act does not deal. Secondly, the Cotton Transport Act can only be fully successful where well-defined areas with good natural boundaries can be chosen within which only one variety of cotton is grown.

There are many areas in India where, owing to limited irrigation facilities or other agricultural reasons more than one type of cotton are grown in the same tract. Again, complete control of the transport of cotton by road is only a practical proposition where the tracts growing different varieties have definite natural boundaries which unfortunately is not always the case.

Under these circumstances, the only practical remedy appears to be to render malpractices at ginning and pressing factories difficult and unprofitable.

The cotton trade, on the whole, appears to be fairly well organised : the cotton growers are mostly small men and not yet organised. Consequently there is ample justification for legislative action to prevent short-sighted middlemen from following a policy likely to cause lasting injury to the cultivators by spoiling the good name and lowering the reputation of the cottons which are actually grown.

APPENDIX V.

AREAS UNDER NEW AND IMPROVED VARIETIES OF COTTON.

The information given below has been collected from the Agricultural Departments as to the available supply of those new cottons which are now grown on a considerable scale. It has been represented to the Committee that the cotton trade have insufficient information as to where and in what quantities these cottons are available. It is hoped that the details now given will be of use to buyers of these cottons.

I. BOMBAY.

Surat 1027—The Agricultural Department supervises 9,000 acres of seed farms the produce of which approximates to 2 500 bales which is guaranteed as true to type and which is marketed at a definite place by arrangement with the growers, full details of these sales can be obtained from the Deputy Director of Agriculture. This represents the first quality produce. The seed issued by the Department is sufficient for $1\frac{1}{2}$ to $1\frac{1}{2}$ lakhs of acres producing 40 000 to 50,000 bales in a normal year. This cotton is marketed mainly at Surat and Navsari, but the above figure includes the cotton grown in Rajpipla State (which has already established a name in the market) and in parts of the Baroda State. In addition a very large section of the portion of the Surat District and the Baroda State south of the Tapti now grows practically pure 1027 cotton. In brief 2,500 bales of absolutely genuine cotton is produced by seed farms and marketed under special arrangement by the Agricultural Department, 40,000 to 50 000 bales are produced in a normal year from certified seed most of which comes into two well-known markets.

Improved Kumbha—Dharwar No 1—The seed farm area is 7,000 acres producing approximately 1,500 bales in a normal season. Seed of known origin is sown on an area of about one lakh of acres producing 25 000 bales, 80 per cent of which arrives at the Hubli market and 30 per cent of which, in addition to 1,500 bales of seed-farm cotton, is marketed by the Hubli Co-operative Cotton Sale Society. Of the cotton marketed by the Society a further 3,000 bales are considered to be practically as pure as that from the seed farms.

Improved Dharwar-American—Gadag No 1 (Upland)—The seed farm area is 6 000 acres producing about 1,000 fully-pressed bales which is sold through the Gadag Co-operative Cotton Sale Society. The produce from certified seed is estimated at 20,000 bales most of which comes to the Gadag market, some 5,000 bales coming to the Cotton Sale Society of which one-half is considered to be equal to seed-farm produce. The Deputy Director of Agriculture invites attention to a new difficulty which has arisen, namely, that after the sales kapas of improved strains is mixed with ordinary bazaar kapas before ginning and before despatch to Bombay, a practice which the Department is very anxious to discourage.

II. MADRAS.

Improved Northerns—Nandyal 14.—The actual seed-farm area is 800 acres in the current year, the area sown with seed supplied by the Department being 9 000 acres producing 1,300 bales, and the area sown with seed supplied by ryots to each

other being 11,000 acres producing 1,500 bales. The total supply of this variety, therefore, is approximately 3,000 bales half of which is known to be pure. The seed-farm cotton is sold by the Agricultural Department by public auction on behalf of the ryots. This variety is mainly marketed in the Nandyal and Tadpatri markets.

Improved Westerns—Hagari 25.—The seed-farm area is 1,200 acres producing 170 bales, the area sown from departmental seed being 9,000 acres producing 1,300 bales and the area sown with ryots' seed 170,000 acres producing 24,000 bales. The total supply of this variety, therefore, is some 25,000 bales mainly marketed at Adoni, Guntakal and Bellary.

Cambodia 295 (now known as Coimbatore No. 1).—This new selection has been distributed to cultivators for the first time during the past year the area being 1,000 acres and the estimated produce 600 bales. The whole of this is grown near Avanashi, the market being Tiruppur. (*Note.*—The total Cambodia crop for the current year is estimated at 369,500 acres and 165,600 bales.)

Karunganni.—The selected "Company" type of Karunganni cotton is grown in two agricultural circles, the area under seed farms being 300 acres producing 100 bales, the area under departmental seed 23,000 acres producing 6,600 bales, the area under ryots' seed 116,000 acres producing 33,500 bales. These figures refer only to the selected Company type of Karunganni. As is well known, this is a recent selection, and ordinary Karunganni now covers practically half of the Tinnevely area. The selected type referred to is mainly sold at the Virudhunagar and Sattur markets.

III. PUNJAB.

Punjab-American.—The total area under Punjab-American cotton this year is reported to be 993,000 acres; the bulk of this is 4F, the markets for which are well known. As regards the two later varieties, 285F and 289F, departmental seed of 285F was issued for 5,476 acres in the Lyallpur Circle of which there are 2,358 acres on the various large estates. The known production of 285F, therefore, amounts to some 2,500 bales; this is much below previous years. The fall in the production of this variety is attributed to inadequate prices (as compared to 4F) in 1924-25.

289F.—Departmental seed for this was issued for over 2,000 acres and in addition some 5,000 acres of this variety have been grown on large estates. The prospective supply of the 289F variety therefore is much the same as that of 285F. For both varieties the principal markets are those of the Lower Bari Doab Canal Colony, *viz.*, Khanewal, Okara and Montgomery.

APPENDIX VI.

LIVERPOOL COTTON ASSOCIATION, LIMITED:

Contract Form 12a.

EMPIRE AND MISCELLANEOUS COTTON DELIVERY CONTRACT NOTE.

Based on Universal Standards for American Cotton.

(Adopted)

LIVERPOOL,.....192 .

Messrs.....

Dear Sirs,

We have this day.....^{to}_{from} you, to be delivered ex warehouse in Liverpool during....., 24000 lbs. cotton net weight to be contained in 50 BALS, more or less, at least equal in value to the Universal Standard for STRICT LOW MIDDLING AMERICAN COTTON but not below the grade of that Standard and of not less than fair staple, or, if tinged or stained, of any grade which (irrespective of allowance to seller for staple) is at least equal in value to the said STRICT LOW MIDDLING Standard (equal in colour to the Standard and of not less than fair staple) at the price of..... pence per lb. for MIDDLING American cotton (Universal Standard), (equal in colour to the Standard and of not less than fair staple) with additions or deductions for such other qualities as are within the contract according to their value as compared with the spot value of MIDDLING (equal in colour to the Standard and not less than fair staple) on the day the cotton is tendered.

Cotton grown in any country the quality of which is within the terms of this contract, may be tendered on this contract with the exception of certain growths of Egyptian and Sudan cotton which are specified below.

There shall not be more than one tender nor more than two lots for each 24,000 lbs. and each 24,000 lbs. shall be treated as a separate contract.

Each tender on this contract must be cotton grown in the same country.

The additions or deductions for quality shall be settled by arbitration, but any lot or any bales not in accordance with the contract may be returned to the seller under the provisions of the Rules.

In the event of cotton of staple better than $1\frac{1}{8}$ ths inch being tendered, the seller shall not be entitled to any allowance in excess of the spot value of $1\frac{1}{8}$ ths inch American cotton of the equivalent grade of the cotton tendered.

The contract, of which this is a note, is made between ourselves and yourselves, and not by or with any person, whether disclosed or not, on whose instructions or for whose benefit the same may have been entered into.

This contract is on "Settlement Terms," and is therefore subject to weekly payments as provided for in the Rules.

This contract is subject to the Rules of the LIVERPOOL COTTON ASSOCIATION, Limited, in force at the date of this contract which provide (amongst other things) for the settlement of differences by arbitration, and in case of any difference the matter shall be settled in accordance with the Rules.

This contract shall not be cancelled on any ground.

The contract, of which the above is a note, was made on the date specified, within the business hours fixed in the Rules.

Yours faithfully,

.....

The growths of cotton that are excluded from being tendered on this contract are :—

1. Sakellaridis and/or similar varieties in growth and staple grown in Egypt or Sudan of the grade of Good Fair Sakellaridis and upwards.

Upper, Brown and/or similar varieties of cotton grown in Egypt of the grade of Good Fair and upwards.

APPENDIX VII.

SPINNING TESTS ON INDIAN COTTONS.

(From Vol II, No. 2 of the "Empire Cotton Growing Review.")

The following tests on (bale) samples of Indian cottons sent by the Indian Cotton Committee have been carried out with the co operation of the Oldham Master Cotton Spinners' Association

Samples of the raw cotton, and of the product after it has passed through the various processes, can be seen at the offices of the British Cotton Growing Association, 333 350, Royal Exchange Manchester

Standards are given in heavy type

Spinning tests of Indian Cotton

FEBRUARY 1925.

Firm Making Test	Growth	Bale No	Per Cent Loss up to Card "over including Invisible Loss	Nominal Counts	Actual Counts at Spindle Point	Lea Strength Test in Lbs	Actual Turns per Inch	Estimated Value Compared with Price of Current Month Futures (Universal Standard)
No 1	American	1027 ALI (Surat)	8 5	Wett 30	31 18	39	21	50 pts. on
				Wett 28	29 00	45 06	19 87	
				Twist 34	34 27	41	30 4	
	Dharwar No 1	5	11 25	Wett 28	30 20	46 125	19.75	Grade—Pass 30 pts on Staple + 30
				Twist 34	37 30	37 6	30 4	
	Cambodia	2	10 75	Wett 30	30 96	47 625	21	Grade—5 45 pts on Staple + 50
				Twist 34	35 83	43 75	30 4	
	Texas American	7 12	14 36	Wett 28	29 82	48	20	Grade—Pass 40 pts on Staple + 40
				Twist 34	36 89	41	30 4	
				Twist 30	33 03	48 87	20 9	
No 2	285 F (Punjab-Am)	21	14 36	Wett 24	25 75	51 75	15 78	75 pts. on
				Wett 28	28 18	55 75	17.18	
				Twist 30	29 9	59 25	20 9	
	289 F (Punjab-Am)	22	18 23	Wett 24	23	53 25	15 78	Grade—80 60 pts off Staple + 20
				Wett 28	25 56	52 75	17 18	
				Twist 30	28 71	68 62	20 9	
	Cambodia	3	10 09	Wett 24	21 81	71 50	15 78	Grade—150 125 pts off Staple + 25
				Wett 28	24 06	57 25	17 18	
				Twist 30	29 34	54 5	20 9	
	Cambodia	3	10 09	Wett 24	23 75	58 5	15 78	Grade + 15 25 pts on Staple + 10
				Wett 28	25 50	59 5	17 18	
				Twist 30	29 34	54 5	20 9	

Firm Making Test:	Growth.	Bale No.	Per Cent. Loss up to Card Sliver.	Nominal Counts.	Actual Counts at Spindle Point.	Lea Strength Test in Lbs.	Actual Turns per Inch.	Estimated Value Compared with Price of Current Month Futures (Universal Standard):
No. 3	Middling American.		9.63	Twist 19	20.14	77.12	15.95	15 pts. on
				" 12	12.86	137.25	12.55	
				Weft 20	21.42	62.25	14.50	
				" 14	14.77	108.12	11.40	
	Karunganni ..	8	10.6875	Twist 16	17.80	78.50	15.15	Grade—25 200 pts. off Staple—175
				" 10	11.54	132.75	12.10	
				Weft 22	24.05	43.37	15.85	
				" 10	11.47	59.62	9.25	
	1027 (Surat). ALF	7	10.125	Twist 16	16.92	101.00	14.60	Grade—25 Pass Staple + 25
				" 12	12.86	138.75	11.80	
				Weft 15	16.67	100.12	12.70	
				" 14	15.21	108.25	11.35	
	Sircar 14 ..	1	15.875	Twist 16	16.73	114.62	14.80	Grade—125 100 pts. off Staple + 25
				" 10	10.68	204.25	11.30	
				Weft 20	21.39	82.00	14.55	
				" 14	15.10	121.12	11.60	
No. 4	Sircar 25 ..	R1	10.50	Twist 20	23.00	58.37	16.45	Grade—40 50 pts. off Staple—10
				" 16	17.65	84.87	15.05	
				Weft 18	20.58	62.75	13.05	
				" 16	17.99	76.25	13.35	
	Bowed American.		10.2	Weft 24	23.57	45.27	15.91	25 pts. on
				" 20	21.07	51.37	14.5	
				Weft 24	23.88	33.75	15.91	
				" 20	20.93	42.25	14.5	
	Karunganni ..	9	11.3	Weft 24	23.66	60.70	15.91	Grade—75 100 pts. off Staple—25
				" 20	20.81	69.12	14.5	
				Weft 24	22.28	68	15.92	
				" 20	20.53	74	14.53	
	Sircar 14 ..	R 2	10.88	Weft 24	22.28	68	15.92	Grade—130 75 pts. off Staple + 55
				" 20	20.53	74	14.53	
	Gadag No. 1 ..	4	16.75	Weft 24	22.28	68	15.92	Grade—130 75 pts. off Staple + 55

SPINNERS' CONVENTS.—No. 1 Firm.

On the Raw Cotton.						On Behaviour in Working.	On the Yarns Produced.
	Staple (Ins.)	Seed and Leaf.	Colour.	Ginning.	Generally.		
1027 ALF (Sarat).	1½	Comparatively free.	Good white to cream	Good.	Very desirable cotton, but attention should be given to developing staple.	Worked fairly well.	This sample is very little inferior to this season's Strict Middling American and slightly brighter in appearance.
D h a r w a r No. 1.	1½	Comparatively free.	Cream.	Good.	The colour will prejudice general use, and whiter strain should be cultivated.	Worked well.	Equal to Strict Middling Bowed in every respect except colour.
Cambodia ..	1½	Comparatively free.	Creamy.	Good.	The cotton is of a nice silky variety, but value would be increased if colour could be made more like American.	Worked well.	Very little to choose for even thread or cleanliness. The sample is a very desirable cotton in every respect except colour.

SPINNERS' COMMENTS.—No. 2 FIRM.

On the Raw Cotton.

Staple (Ins.)	Seed and Leaf.	Colour.	Ginning.	Generally.	On Behaviour in Working.	On the Yarns Produced.
285F (Punjab Am.)	Too much of both. Also crushed seed with oil stains.	White.	Not good.	This cotton is strong, less neppy than 289F, but lossy.	Did not spin well (uneven and nep- py).	This 285 F is in many res- pects like 289 F, but is better ginned and does not contain so much trash. It is brighter and a better colour than 289 F, but inferior generally, although slightly longer in staple. Stronger in pull than American Texas after allowing for coarse counts. For weft it will spin higher counts than those tested, but it needs to be better ginned and grown from a seed which will give a more even running staple.
Cambodia .. 1 1/32	Satisfactory.	Cream.	Satisfactory.	This type is nearest to the American-grown cotton.	Spun and looks more like American than others tested.	This type (Cambodia) spun well. It is much like the Texas against which it was tested. It is the nearest in value to Ameri- can, and could be used extensively if grown in quantity and kept equal to this bale. Comparing the counts and strength per lea with the American, there was little in them, but 30s T is quite far enough to make a really satisfactory twist yarn. It will spin 32s weft with a low draft.

SPINNERS' COMMENTS—No 2 Firm—contd.

On the Raw Cotton.					On Behaviour in Working.	On the Yarns Produced.
Staple (Ins.)	Seed and Leaf	Colour.	Ginning	Generally		
289F (Punjab Am.)	Bad	Dull white or grey.	Poor.	The waste loss is very heavy. The cotton is strong and free from excessive moisture. Bad for neps	This type is very neppy and spun the worst of the types sampled	Spinners on all counts were unanimous that this type was the worst spinning cotton. Whilst it was longer in staple than other types, its hard character made it the worst spinning cotton even with standard turns in. Its worst features are its neppy character, unevenness, and great waste loss. Taking 13½d as the value of the F. M. Texas American Cotton it was tested against, it would require to be 2d. per pound cheaper in price for waste loss alone, to say nothing of the inferior yarn it produced in other respects.

SPINNERS' COMMENTS.—No. 3 FIRM.

On the Raw Cotton.					On Behaviour in Working.	On the Yarns Produced;
Staple (Ins.)	Seed and Leaf	Colour.	Ginning.	Generally.		
Karunganni.	Clean.	Good and bright, slightly creamy.	Fairly well ginned.	This cotton is of a very soft nature with very low natural twist. Requires highly twisting to get anything approaching strength of (Universal) Middling American cotton. Suitable only if used alone for very soft yarns about 20s. Worth cultivating for mixing with American.	Worked badly with normal conditions; improved with extra twist.	Suitable only if used alone up to 20s in soft spun yarns. A nice even yarn; in appearance equal to one spun with American cotton, but would fail by reason of lack of strength.
1027 ALF (Surat.)	Slight leaf, but cleans easily.	Creamy and bright.	Good.	Very useful cotton, and large quantities could be used in Lancashire. Fully equal in value to (Universal) Middling American.	Very good.	This cotton makes a clean, bright yarn of a marketable medium quality. Suitable up to 30s twist and 40s weft.
Sircar 14 ..	Large amount of small leaf.	Creamy.	Too much leaf left in.	A cotton worth cultivating, but should be sent in cleaner condition. If this was done the cotton would be fully equal to Universal Middling.	Good.	This cotton produced a good yarn, very strong and even, but rather too much leaf. It is capable of being spun to 36s twist and 40-44s weft of medium quality.
Sircar 25 ..	Very clean.	Creamy.	Fairly well ginned.	A cotton worth cultivating. It is slightly below Universal Middling in value, but would be very useful in Lancashire.	Did not work well owing to harshness of fibre and difficulty in introducing twist.	Makes a clean, bright and even yarn of moderate strength. Compares reasonably with medium quality American yarn. Suitable up to 20s twist and 30s weft.

SPINNERS COMMENTS—No 4 Firm

On the Raw Cotton

Gadag No 1	Seed and Leaf	Colour	Ginning	Generally	On Behaviour in Working	On the Yarns Produced
	(table Isn)					
Marunganni	Contains full unbroken seeds but only slightly leafy	Beautiful creamy white	Too many full seeds otherwise fairly good	A very nice Indian cotton of fine texture good colour bright and fairly clean but too short in staple to spin by itself counts higher than 18s to be of commercial value	Very poor spinning cotton being too soft will spin up to 18s counts but to do this will require many extra turns in twisting in both card room and spinning room	—
S rear 14	Fairly free from both seed and leaf	Bright but creamy colour similar to Cambodia.	Good	A very nice class of Indian cotton Fine silky texture Good in colour staple brightness and cleanliness and regularity Similar to good-class Cambodia A fair substitute for American Bowed cotton Will spin by itself into 22s counts of commercial value	Fairly good spinning cotton up to 22s counts Does not require any extra twisting in card room but does require extra twisting in spinning room.	—
Gadag No 1	Very leafy and much broken seed.	Rather dull and creamy	Not satisfactory (too much broken seed)	Fair staple fine texture brightness and cleanliness no ass factory Too short in staple to spin finer than 24s counts by itself to be of commercial value	Good spinning cotton run in both card room and spinning room with same turns as Bowed American Its peculiar feature is that it leaves quite a quantity of loose fly or fibre on the roller beam of the spinning mule	Will spin nicely up to 24s counts

APPENDIX VIII.

THE FINANCE OF THE COTTON CROP UP-COUNTRY.

Question 1.

"What methods does the cotton grower usually resort to for the finance of his cotton during cultivation and after harvest?"

Question 2.

"In what areas and to what extent is the cotton crop of the average cultivator (a) mortgaged in advance on account of loans taken to finance the cultivation of the crop and (b) sold in advance of harvest, and, if so, on what conditions?"

Question 3.

"To what extent are cultivators driven to sell their cotton immediately through lack of financial power to hold it?"

Question 4.

"What marketing systems are in force in the province or tract with which you are acquainted? To what extent does the cultivator receive an unduly low price because of lack of proper market facilities rather than because he is pressed for money?"

Question 5.

"Is it possible for cultivators to obtain loans on the security of cotton deposited for sale, if so, to what extent and what rate of interest are they charged for such loans?"

Question 6.

"In your opinion are warehousing or other storage facilities necessary to enable the cultivator to hold and finance his cotton?"

Question 7.

"In the area reported on are there any Co-operative Cotton Sale Societies at work? If so, on what lines do they work? In particular what is the method of sale adopted and what percentage of the value does the Society advance against cotton or kapas delivered? Is any provision made by legal agreement, or by the rules of the Society, which secures for the Society a sufficient proportion of its members' produce to enable it to sell to advantage or can members utilise the Society when it suits them only and sell outside on occasions when prices are tempting? Is the cotton or kapas sold on individual account or is the produce of members pooled?"

Question 8.

"If no Cotton Sale Societies are in existence, have they been tried? Are there any particular local difficulties in dealing with the sale of cotton by co-operative methods?"

Question 9.

(a) "If there are substantial cotton growers in the tracts with which you are acquainted who control considerable areas, what methods do they adopt for the financing of their crops and how do they market them?"

(b) "Are there any marked differences as compared to the methods adopted by smaller growers, and have such large growers any special difficulties in marketing their crops to the best advantage?"

Question 10.

“What organised banking facilities exist in your area for the finance of the cotton crop?”

“Are such facilities sufficient?”

Note —Under banking facilities are included private Indian Bankers and Shroffs as well as Joint Stock Banks.

APPENDIX IX.

FINANCE OF THE COTTON CROP.

VILLAGE INVESTIGATION.

General for each Village.

1. Name of village.
2. Total cultivated area.
3. Area under cotton this year.
4. Area under cotton last year.
5. How does this year's crop compare with last year's ?
6. Is the crop this year earlier or later than usual, and how much ?
7. What is (are) the nearest cotton market (s); what is the distance ; and
Is the road good, fair or bad ?
8. Is there any storage accommodation for *kapas* in the village ?

INFORMATION TO BE OBTAINED FROM EACH COTTON GROWER.

Village.

Name of cotton cultivator.

Is he a proprietor or tenant ?

Total area of his holding.

Area under cotton.

(Survey numbers.....)

Anticipated yield of *kapas*.

Variety.

1ST PERIOD.

Information between.....

1. Has any advance been taken for cultivation up to date ?
2. If so, how much ?
3. What amount has been signed for ?
4. Rate of interest.
5. Source of advance.
(Co-operative Society, Sowcar, cotton trader.)
6. Is there any bond to sell *kapas* through the lender, or to the lender ?
7. Is the crop already sold, and the price fixed either on acreage or on weight?
If so, to whom and for what price ?

2ND PERIOD.

Information between.....

1. How much *kapas* has been picked so far—approximately ?
2. Has any advance been taken on this *kapas* ?
3. If so from whom, and under what conditions ?
4. Has any *kapas* been actually sold ? If so, to whom and where, and
when ?
Was it sold through a dalal or arti ?

- 5 Has the money been received for this *kapas* ?
- 6 What was the rate ?
- 7 What was the money actually received ?
- 8 Where was the *kapas* delivered ? How far away ? Who paid for cartage ?

3RD PERIOD

Information between.....

- 1 What was the quantity of your whole crop of *kapas* ?
- 2 How much now remains with you ?
- 3 Have you received the whole money due on the *kapas* sold ?
- 4 How many carts were sold locally, and how many were carted to the market and sold there ?
(If quantities small state weights)
If sold in the market, was it sold through a broker ?
Was the cotton sold outright or deposited with an arti or bania for sale ?
- 5 Did you ascertain the market rates before selling ? If so, how ?
- 6 Has an advance been taken on the *kapas* remaining with you ?
- 7 If so, from whom and under what conditions ?
- 8 What rate are you now offered for this *kapas* locally ?
(Market rates can be found separately)

General

(Such information as can be obtained about difficulties in marketing in finance and in holding for higher prices)

- 1 Would an open cotton market with open prices be any advantage to you ?
If so, how ?
- 2 Is there any difficulty in knowing the rate at which your agent sells your *kapas* and in recovering the full money ?
- 3 Are deductions made from the price ?
- 4 If so what are they said to be for—and what rate is said to be charged ?
- 5 If you take *kapas* to market, and cannot get a good rate for your cotton, what do you do with it ?

MARKET INVESTIGATION

Instructions.—A book is provided for each day's work. The general information required for each market will be obtained gradually. Spare pages are provided at the end of each book for the notes you will make in this connection.

Information to be obtained each day.

- 1 Name of market
- 2 Date
- 3 The market rate when fixed
- 4 Any change in the rate during the day
- 5 Were any Bombay rates posted up, if so, what rates and when ?

Information to be obtained from individuals bringing Kapas to Market for sale.

1. Date.
2. Was the *kapas* grown by you or have you bought it ?
3. What is the rate which you have accepted ?
4. What money have you received ?
5. What weight of *kapas* have you brought ?
6. To what deductions have you agreed ?
7. Have you taken an advance and if so, of what amount and from whom?

General information to be obtained for each Market.

- *1. How is the market managed ? Attach a copy of any local by-laws or rules regulating trading in *kapas* or cotton.
- *2. Is there any local Market Committee of any kind ; if so, who are the members ? What are their occupations ?
- †1. Attach a copy of the local by-laws and rules.
- †2. Who are the members of the Market Committee ?
3. Describe in detail how sales are conducted.
4. Can cultivators bringing *kapas* to the market sell direct or must they employ brokers ?
5. What is the system of buying ? Do buyers buy direct or employ brokers?
6. Do brokers and arhatyas act for *both* buyers and sellers ?
7. Do buyers give advances against *kapas* deposited for sale, if so, what percentage of the value and at what interest ?
8. If daily (or opening) rates are fixed, how is this done, and how are they announced ?
9. Are Bombay rates posted in the market regularly ? If so, what rates and how obtained ?
10. Are there any arrangements for storage in the market ? Is *kapas* stored in artis' shops, or godowns, or in ginning factories, *on sellers' account* ?
11. Do the market records show daily arrivals ? Compile a statement of daily and monthly arrivals for last season from the records available and of prices for the same dates.
12. State the system of weighment in use. Are there any complaints from cultivators about weighments, if so, what ?
13. How is the weighman paid and how much ? By whom is he employed ?
14. What are the allowances and deductions customary in the market ? Is there any complaint from sellers that these are unfair ?

* For Khandesh enquiry.

† For Berar enquiry.

APPENDIX X

GOVERNMENT OF INDIA

DEPARTMENT OF EDUCATION HEALTH AND LANDS,
(Agriculture).

SIMLA the 24th of July, 1925

Press Communiqué

Owing to the serious ravages in America of the Mexican Cotton Boll Weevil and the danger of its effecting an entry into India in imported American cotton, the Government of India have had under consideration the question of taking preventive measures against its introduction. Experience in America has shown that once this pest has established itself no measures however costly have much effect in combating its extreme destructiveness. Although the average imports of American cotton are very small the total prohibition of such imports is not considered desirable except as a last resort as Indian mills in certain years utilise this cotton when the supply of Indian stapled cotton is short. The lines on which it is proposed to take action with effect from the 1st of October 1925, are now published for the information of the trade in general.

2 It is proposed that under the Destructive Insects and Pests Act 1914 (II of 1914) the importation of American cotton should be allowed only after proper fumigation. There are obvious advantages in restricting the entry to one port at which adequate fumigation facilities can be provided and as the imports of American cotton during the past few years at ports other than Bombay have been negligible it is proposed to allow imports only through the port of Bombay for the present. As the cotton will be fumigated in barges before landing it will be impossible to do it satisfactorily during the monsoon period and it is therefore proposed to limit the importation to the fair season between the 1st of November and 31st of May. In order to ensure the orderly progress of fumigation importers will be required to obtain advices by cable of all shipments of American cotton at the time of despatch from the foreign port and to notify the authority appointed to supervise the fumigation.

3 The necessary equipment and staff for fumigation will be provided by Government and a charge for fumigation made to importers which including extra handling charges is estimated at not more than Rs 3 per bale.

GOVERNMENT OF INDIA

DEPARTMENT OF EDUCATION HEALTH AND LANDS (AGRICULTURE)

SIMLA the 25th September 1925

Press Communiqué

In July last the Government of India announced that owing to the serious ravages in America of the Mexican Cotton Boll Weevil and the danger of its effecting an entry into India in imported American cotton they had decided to allow the importation into India of such cotton under the Destructive Insects and

Pests Act, 1914 (II of 1914), only through the Port of Bombay and after proper fumigation, between the 1st of November and 31st of May each year. Action on these lines was to have been taken from the 1st October, 1925. Owing, however, to delay in the arrival of some parts of the necessary equipment, it has been decided not to bring these restrictions into force before the 1st December, 1925.

GOVERNMENT OF INDIA.

DEPARTMENT OF EDUCATION, HEALTH & LANDS.

No. 1493—*Agriculture.*

DELHI, the 14th November, 1925.

NOTIFICATION.

In exercise of the powers conferred by sub-section (1) of Section 3 of the Destructive Insects and Pests Act, 1914 (II of 1914), hereinafter referred to as the said Act, the Governor-General in Council is pleased to issue the following order for the purpose of regulating the import into British India of American cotton :—

1. In this order—

(i) “Cotton” includes all ginned cotton, whether baled or loose, but does not include cotton seed or unginned cotton.

(ii) “American cotton” means all cotton produced in any part of America.

2. On or after the 1st December, 1925, American cotton shall not be imported into British India by means of the letter or sample post and shall not be imported by any other means save through the port of Bombay between the first of November and the thirty-first of May in any year and subject to the following conditions :—

(a) On or before the departure of a ship carrying a consignment of American cotton for Bombay from the port from which the cotton is consigned the consignee shall ascertain the name of the ship, the probable date of its arrival in Bombay and the number of bales of American cotton contained in the consignment and shall furnish this information to the Collector of Customs, Bombay, as soon as possible and in any case not less than three weeks before the arrival of the ship ;

(b) on arrival at Bombay, the cotton shall be disinfected in such manner as shall be prescribed in rules made by the Government of Bombay under Section 5 of the said Act ;

(c) prior to landing the cotton the importer shall pay or agree to pay a sum at a rate fixed by the Governor-General in Council sufficient to cover the cost of fumigation.

(Sd.) R. B. EWBANK,

Offg. Secretary to the Government of India.

GOVERNMENT OF INDIA.

DEPARTMENT OF EDUCATION, HEALTH AND LANDS

No 1560—Agriculture.

DELHI, the 26th November, 1925.

NOTIFICATION.

In exercise of the powers conferred by sub section (1) of Section 3 of the Destructive Insects and Pests Act, 1914 (II of 1914), the Governor General in Council is pleased to direct that the following amendment shall be made in the order published with the notification of the Government of India, Department of Education, Health and Lands, No 1493-A, dated the 14th November, 1925, namely —

In clause (a) in paragraph 2 of the said notification for the words "and in any case not less than three weeks before the arrival of the ship" the following shall be substituted, namely —

"Save where the cotton is loaded for Bombay at a European port the ordinary length of voyage from which is less than three weeks, this information shall be furnished not less than three weeks before the arrival of the ship at Bombay"

(Sd) R B EWBank,

Offg Secretary to the Government of India.

No 1561—Agriculture.

DELHI, the 26th November, 1925.

NOTIFICATION.

In pursuance of clause (c) in para 2 of the Notification of the Government of India, Department of Education, Health and Lands, No 1493-A, dated the 14th November, 1925, the Governor General in Council is pleased to fix the rate at which the sum therein referred to is to be paid at Rs 3-6 0 per bale, or in cases in which the importer has failed to furnish information in accord with clause (a) in para 2 of the said notification at Rs 5-6 0 per bale. This rate shall cover the cost of fumigation including the cost of loading the cotton into the barge, conveyance to the fumigation wharf or bunder, unloading from the barge after fumigation and delivery at the bunder, but not including import wharfage. Provided that the minimum fee for the fumigation of any consignment of cotton shall be rupees one hundred and fifty.

2 In the case of samples of American cotton imported by parcel post, or as ship's parcels not exceeding 20 lbs each in weight, the consignee shall pay a fee for fumigation of rupees two for each parcel

(Sd) R B EWBank,

Offg Secretary to the Government of India

GOVERNMENT OF INDIA:

DEPARTMENT OF EDUCATION, HEALTH AND LANDS.

No. 76—Agriculture.

DELHI, the 14th January, 1926:

NOTIFICATION.

In exercise of the powers conferred by sub-section (1) of Section 3 of the Destructive Insects and Pests Act, 1914 (II of 1914), the Governor-General in Council is pleased to direct that the following further amendment shall be made in the order published with the notification of the Government of India, Department of Education, Health and Lands, No. 1493-A., dated the 14th November, 1925, namely :—

For clause (a) in paragraph 2 of the said notification, the following clause shall be substituted, namely :—

“(a) on or before the departure of a ship carrying a consignment of American cotton for Bombay from the port from which the cotton is consigned, the consignee shall ascertain the name of the ship, the probable date of its arrival in Bombay and the number of bales of American cotton contained in the consignment, and shall furnish this information to the Collector of Customs, Bombay, not less than three weeks before the arrival of the ship at Bombay ; provided that where the cotton is loaded for Bombay at Port Said or at a European port the ordinary length of voyage from which is less than three weeks, it shall be sufficient to furnish the information not less than 10 days before the arrival of the ship.”

(Sd.) R. B. EWBank,
Officiating Secretary.

GOVERNMENT OF INDIA.

DEPARTMENT OF EDUCATION, HEALTH AND LANDS.

No. 144—Agriculture.

DELHI, the 26th January, 1926.

NOTIFICATION.

In pursuance of clause (c) in paragraph 2 of the Notification of the Government of India, Department of Education, Health and Lands, No. 1493-A., dated the 14th November, 1925, the Governor-General in Council is pleased to direct that the following amendment shall be made in the notification of the Government of India, Department of Education, Health and Lands, No. 1561-A., dated the 26th November, 1925, namely :—

In paragraph 1 of the said notification for the words "but not including import wharfrage" the following shall be substituted —

"but not including docks import charges as specified in the Bombay Port Trust Scale of Rates charged at the docks"

(Sd) J W BHORE
Secretary to the Government of India

GOVERNMENT OF BOMBAY,

REVENUE DEPARTMENT.

BOMBAY CASTLE 26th November, 1925

No 4388/24—In exercise of the powers conferred by Section 5 of the Destructive Insects and Pests Act 1914 (II of 1914) the Government of Bombay (Transferred Departments) is pleased to make the following rules for the detention and disinfection of American cotton the fumigation of which is required by the notification of the Government of India in the Department of Education Health and Lands No 1493 Agriculture * dated the 14th November 1925 and of cotton which has been in contact or proximity thereto and for regulating the powers and duties of the fumigation authority namely —

- (1) These rules may be called the Fumigation of American Cotton Rules, 1925 They will come into force from 1st December 1925
- (2) Except as provided in Rule 5 no American cotton or any other cotton the fumigation of which is required by the notification of the Government of India in the Department of Education Health and Lands, No 1493 Agriculture * dated 14th November, 1925 hereinafter called the said notification or any other cotton which may have been in contact or proximity thereto shall be landed without fumigation Such cotton shall on arrival at Bombay be fumigated with hydrocyanic acid gas Fumigation shall be carried out by the Trustees of the Port of Bombay on behalf of Government Such cotton shall be taken overside from the vessel into barges provided by the fumigation authority and shall be conveyed to the fumigation wharf or bunder in such barges delivery being given at the fumigation wharf or bunder only after fumigation The rate of discharge of cotton from vessels shall be so regulated as not to exceed the capacity of the barges provided for the purpose
- (3) Cotton other than American cotton which is imported into British India in a vessel carrying American cotton and loaded in the same hatch as any bale or bales of American cotton shall be deemed to have been in contact or proximity thereto and shall be subject to the restrictions and conditions specified in the said notification

* Republished at page 3023 of Part I of the *Bombay Government Gazette* dated 26th November, 1925

- (4) For the purposes of these rules the fumigation authority shall be the Collector of Customs, Bombay, or such officer as he may appoint.
- (5) Samples of American cotton imported by parcel post, or as ships' parcels not exceeding 20 lbs. each in weight, shall be fumigated on arrival with hydrocyanic acid gas, or such other fumigant as may be approved by the Governor-General in Council, at the Customs House.
- (6) All cotton the fumigation of which is required by the said notification or under these rules shall be at the sole risk of the importer during landing, transshipment and fumigation and no liability for loss or damage due to fumigation shall attach to Government or its agents.
- (7) Any breach of these rules shall be punishable with a fine which may extend to Rs. 1,000.

By order of the Government of Bombay (Transferred Departments),

G. A. THOMAS,

Secretary to Government.

APPENDIX XI.

THE PRESENT POSITION OF COTTON RESEARCH IN INDIA

INTRODUCTION

The position of cotton research in India was reviewed by the Indian Cotton Committee in 1917-18 and has received constant attention from the Central Cotton Committee since 1921. In putting forward their proposal for the cotton cess the Committee drew attention to some of the outstanding cotton problems requiring attention and several of these are now under investigation with the aid of grants from cotton cess funds. In December 1924 the Committee decided that the time had now come to adopt a more definite research programme. A note* by Mr. Hilson was circulated and arrangements made for a full discussion of the subject at a special meeting of the Agricultural Research Sub Committee in February 1925. The Sub Committee's conclusions were discussed, amended and adopted by the full Committee during the succeeding week. The report in its present form records the considered findings of the Indian Central Cotton Committee though rearranged for publication.

Nearly all the work which has been done in the past for the improvement of cotton growing in India has been carried on by the Provincial Agricultural Departments and future progress must continue to depend largely on their efforts. It is obvious therefore that without a general review of work in progress the Committee could not profitably have discussed their own programme. It is from this aspect that work in progress has been discussed and not in any spirit of criticism of the policies adopted by various Agricultural Departments in their efforts to meet local needs. The Indian Central Cotton Committee can only supplement such work and since their funds are limited must obviously concentrate on those lines of scientific enquiry which are of the widest interest to India as a whole.

Attention is also invited to the information collected in the Committee's Bulletin on the demand for the various types of Indian cotton and to the conclusion there drawn that at present the ratio of medium to short stapled cottons in the Indian cotton crop is too low.

One can approach a discussion of this nature from at least two distinct standpoints—the technical and the economic. Both these aspects have been considered in the report. Mr. Hilson's note which was prepared as a basis of discussion explains the bearing of studies in heredity and of environmental effects on the practical problems which it is desired to solve. This note forms an appendix to the report. The report of the Indian Cotton Committee (1917-18) dealt with conditions in the various cotton growing tracts and made detailed recommendations for the improvement of the various agricultural and commercial varieties. By examining the position from both aspects it is hoped that not only have the technical problems been more clearly formulated but their bearing on the Indian cotton supply explained.

* Appendix (page 104)

I.—THE POLICY IN REGARD TO AGRICULTURAL RESEARCH FOLLOWED BY THE INDIAN CENTRAL COTTON COMMITTEE HITHERTO.

The necessity of a definite policy as well as of a programme of work is obvious. It is of importance, therefore, to consider the extent to which a policy has already been settled in the earlier discussions of the Committee, the extent to which this is being followed and whether the indications obtained from about one-and-a-half years' work show that we are on right lines.

At the first meeting of the Indian Central Cotton Committee it was decided :—

- (1) That Technological Research should be under the Committee's own direction and control.
- (2) That Agricultural Research should be promoted by (a) grants-in-aid to Provincial Agricultural Departments and other institutions, and (b) the creation of research studentships.
- (3) At the third and subsequent meetings the necessity for a Central Agricultural Research Institute for cotton work was emphasised.
- (4) The various discussions in Committee and the statement of our objects made to the Legislative Assembly on our behalf by the Government of India may be summarised fairly as follows :—
 - (a) Grants-in-aid should be in support of schemes of more than local importance.
 - (b) The Committee desire by every means in their power to provide for more qualified research workers on the problems connected with cotton improvement.
 - (c) Care must be taken to supplement the work of Agricultural Departments and not to compete with them or to permit the use of cotton cess funds to enable Local Governments to reduce their own expenditure on cotton improvement.
 - (d) The Committee adopted the principle of subsidising existing institutions for special investigations on the grounds that this procedure would enable advantage to be taken of existing buildings, land, equipment and experienced staff and was thus likely to lead to the maximum return from a limited expenditure.

The policy laid down has been followed in respect to all schemes for which grants have been given and every grant given has enabled new work to be started. The Committee's grants have enabled 43* more full-time scientific workers and 10 research students to be employed on cotton problems.

The new Institute of Plant Industry at Indore, which the Committee's grants have made possible, provides an agricultural research station which is not only situated in the largest homogeneous cotton tract in India but is ideally placed for the investigation of the many urgent problems which this tract presents.

* Including appointments which will be filled during the coming year.

II.—WORK IN PROGRESS.

The Study of Hereditary Characters.

All work on cotton genetics in India is being carried out incidentally to practical plant-breeding work which has an immediate economic objective, *viz.*, the improvement of the cotton of particular tracts. This is all to the good provided that short-sighted views of immediate needs do not prevent the more purely scientific work from being completed.

Yield—A great deal of fundamental work was done by Dr. Leake in the United Provinces which has been of much use to other workers. It is understood that the Assistant Economic Botanist who is now responsible for cotton work in the United Provinces is mainly occupied with the working up from the practical and economic aspect, of the material left by Dr. Leake.

In Madras, Hilson has work in progress which though definitely economic in character includes the study of the inheritance of characters. The same applies to the work of Kottur and Patel in Bombay, Youngman in the Central Provinces and Thadani in Sind.

So far as the Committee's research grants are concerned, the assistance which we have given has enabled a detailed study of the *Oomras* cottons to be undertaken in the Central Provinces and Berar and in the course of that work unit species are being studied. The research which we are financing at Dhrwar on the improvement of the Bombay Upland-American type by hybridisation, also affords considerable opportunity for the study of hereditary characters. The Madras *Herbaceum* cotton scheme in its present stage is again largely a matter of the identification and separation of unit species and here again the inheritance of characters is being studied. It is, however, at the Indore Institute of Plant Industry that the Committee are making the most definite provision for work on these lines: this will be referred to later.

It is probably a fair review of the *present* position to say that far too little work is in progress on the analysis of the hereditary characters which determine the yield of cotton per acre.

Quality—In regard to the study of the hereditary characters determining quality the Committee have already taken the initiative by providing facilities for the testing of cottons and for the study of the cotton fibre. The Committee's Spinning Laboratory now provides a means of actually testing cottons to determine if they are satisfactory from a spinner's standpoint and this in itself is a great step forward so far as actual plant-breeding work is concerned. But one cannot study the heredity of a compound of innumerable characters, hence technological and agricultural research are essentially complementary. What is most urgently needed is a statement of the extent to which the various measurable characters of the cotton fibre are significant in determining spinning value. This is the other branch of the work now being undertaken at the Committee's technological laboratory. It is unnecessary to go into detail as the question of the aims and functions of that laboratory have been stated very fully in a recent publication.*

* Pamphlet on the Technological Laboratory published in connection with the opening ceremony by His Excellency the Viceroy.

Work in progress for the improvement of existing varieties by modern plant-breeding methods.

The practical application of plant breeding work is more obvious if considered from another standpoint, *viz.*, to which of the existing agricultural varieties modern plant breeding methods are being applied to secure improvement in quality and yield. This is shown very briefly in the following table :—

Bombay†	..	Surat	..	Improved types in cultivation and further work in progress. The type Surat 1027 A.L.F. with a staple length of 1" (full) is now grown on 175,000 acres.
		Broach	..	Work in progress and several new types undergoing field trials.
		Dholleras	..	The most important (<i>Wagad</i>) component is under study and pure strains have been obtained and are being tested. The <i>Lalio</i> area is really an extension of the Broach area and is therefore covered by the work on Broach.
		Khandesh	..	Work in progress to obtain a superior type by hybridisation.
		Kumpta	..	Improved types in cultivation and further work in progress. The Dharwar No. 1 type has now reached 75,000 acres.
		Dharwar-Upland	..	An improved type, Gadag No. 1, is now grown on 65,000 acres. Further work is in progress.
Sind ..	..	Bengal-Sind	..	Selection of types in progress and one strain is coming into general cultivation.
		Sind-American	..	The Punjab 4F type is cultivated to the extent of some 16,000 acres. Pure strains of acclimatised American cottons have been isolated and are under field test. The prospects of long-staple cotton-growing have been immensely improved by the commencement of work on the Lloyd Barrage Canal system and special provision is being made for experimental work on new lines.

† The Baroda cotton growing areas are much inter-linked with those of the Bombay Presidency and by arrangement a uniform policy for the introduction of new strains is followed by the two departments.

Punjab	.. Punjab-American.	The area* under this variety in 1923-24 was 604,000 acres of which 582,000 acres was estimated to be under strain 4F and 21,000 acres under strain 285F. The further study of these cottons is the subject of one of the Committee's research schemes.
	Indigenous ..	The indigenous types have been fairly completely surveyed and work is in progress for the provision of better types for the unirrigated tracts.
Burma	.. Wagale & Wagyi.	Now under study under the supervision of the Deputy Directors of the Myingyan and West Central Circles respectively.
Mysore	.. Kumpta type .. American type ..	Pure line selection work in progress. Work for improvement by hybridisation in progress.
Bengal	.. Garo Hill type (<i>G. Cernuum.</i>)	Is receiving attention from the Bengal Department of Agriculture.

The present position may be summarised as follows :—

In the existing long-staple tracts steady progress has been made in improving both staple and yield by selection. In new long-staple tracts the introduction of acclimatised exotics has brought about the replacement of short-stapled cottons by long in two outstanding instances, *viz.*, Punjab-American and Cambodia and in both cases, work is in progress to obtain better strains.

In short-staple tracts some work for the improvement of staple is in progress but the main successes have been in the improvement of yield and ginning percentage. Practically no work is in progress for the production of long-staple types to replace the 5/8" staple type. This is by far the most difficult problem and yet the most essential if our aim is to raise the production of long-staple cotton in India to the proportion which is needed to safeguard the grower and to enable the Indian mill industry to progress.

Environmental Factors.

It is not so simple to summarise all work in progress under this head, as to do so would involve a summary of all the work of Agricultural Departments on cotton. But so far as the study of problems of general importance is concerned and excluding manures, manuring and local problems, probably the following is a fairly complete summary :—

* 934,000 acres in 1924-25.

- (a) *The water requirements of the cotton plant*—For the tracts which grow cotton under irrigation a certain amount of information has been collected in connection with varietal and other field tests. Such experiments have been mainly directed to the determination of the effect on *yield* of different numbers of irrigations at varying dates. Some preliminary information has been collected as to the effect of shortage of irrigation water on lint quality. Important as it is the irrigated cotton area however is only a relatively small proportion of the Indian total and so far as rain fed cottons are concerned little has been done as yet to determine the exact effect of excessive rainfall or to design methods of amelioration. In the Bombay Presidency, as part of a general investigation of conditions in tracts of markedly defective rainfall the employment of a Soil Physicist has enabled progress to be made in the designing of cultural methods which enable better use to be made of a limited precipitation and better crops raised.
- (b) *Bull flower and boll shedding*—The causes of loss of crop by shedding are being investigated at Surat with the aid of a grant from the Committee as part of a study of the physiology of the *Herbaceum* type of cottons in Gujerat. Mr. Hilson has done a considerable amount of work on this subject at Coimbatore the results of which are now in the press* but lack of staff has prevented the work being further developed.
- (c) *Effect of season and other environmental factors on quality*—Since work on this group of problems necessarily involves an organisation for testing cottons for quality it has only now been rendered possible by the opening of the Committee's Technological Laboratory. Collaboration between the laboratory and agricultural investigators will be necessary and attention is invited to Section V of Mr. Hilson's memorandum.
- (d) *Pests and diseases* (1) *Pests* (1) *Pink Bollworm*—The Madras Agricultural Department has practically completed the study of pink bollworm in that Presidency a Pest Act was put into operation and *has been proved to be a satisfactory method of dealing with the pest under their conditions*.
- In Northern India the life history and distribution of this insect is being studied both in the United Provinces and the Punjab. A special investigation the object of which is to design control measures is being carried out at Cawnpore with the aid of one of the Committee's research grants.
- (2) *The Spotted Bollworms*—At Surat one of our research grants has enabled an investigation to be undertaken on the spotted bollworms which constitute the principal pest of cotton in many parts of India and are important in practically all cotton growing tracts. Some work is also in progress in the United Provinces and the Punjab on these pests.

* P a Bulletin No 156,

- (3) *The Stem Weevil*.—The stem weevil is an important pest in Madras where it is extending; it is also important in some years in Gujarat and exists in the Punjab. The life history of *Pempheres** has been studied by Ballard at Coimbatore and the results published. Control measures have yet to be worked out, but no staff is available for the continuance of the work.
- (4) *Jassids, etc.*—The extent to which some varieties of American cotton are attacked by this group of insects is familiar to most agricultural officers. Fortunately the fact that hairy-leaved cottons are but little affected was recognised at an early stage and the trouble was overcome by the selection of such types. But this limitation gives rise to other difficulties in certain tracts and, further, even hairy types are not always immune. It is clear that further work is needed.
- (5) *General*.—At the Pusa Research Institute a considerable amount of work on the life histories of the major cotton pests has been carried out, thus providing valuable information for workers in other parts of India.
- (II) *Diseases*.—The outstanding cotton disease is wilt. The Committee are financing two investigations on this subject, one at Dharwar and one at Nagpur and the two investigators are tackling the problem from different aspects. This duplication is justified not only by marked differences in the agricultural conditions of the two tracts, but by the difficulty and importance of the problem.

Probably insufficient attention has been paid in the past to the physiological aspect of plant diseases. A study of the reasons underlying the varying resistance of different strains of cotton to disease and insect attack should provide important indications as to possible methods of control.

Summary.—Though there are important gaps, which will be referred to later, the above abstract might indicate at first sight that a large part of the field is being covered. It is only on considering the staff employed that one realises the entire insufficiency of present efforts. Good work has been done, and is being done, but every agricultural officer knows and admits that progress is greatly retarded by lack of a sufficient number of qualified workers.

III.—PROBLEMS AWAITING INVESTIGATION.

It is now necessary to consider which are the most important problems still awaiting investigation. For the purposes of the present discussion it is convenient to exclude soil surveys and the general study of manures and manuring. Not only do these questions form a section of the normal work of every Provincial Agricultural Department but they are not best approached from the standpoint of the needs of a single crop.

Dealing first with the more purely scientific side the position is somewhat as follows :—

* Pusa Memoir.

1 *Cotton genetics*—Our knowledge of the factors determining yield and quality and of their inheritance is most imperfect. In regard to quality, the plant breeder requires to be told what measurable characters of the lint are most important. It is one of the main objects of the Committee's Technological Research Laboratory to ascertain the bearing of these characters on spinning value. Some work is being done on cotton genetics by Agricultural Departments and in connection with the Committee's research schemes and such studies will form an essential portion of the cotton research programme of the Indore Institute of Plant Industry. Much more work is required than is in progress at present.

2 *Unit species*—The isolation, identification and study of the unit species (or pure lines) of which the agricultural varieties are composed is a most important part of all work for the improvement of plants. While this has been by no means entirely neglected in the course of the work which has been done and is being done, no agricultural variety has been worked through completely. This question has been given great prominence in the programme of work of the Institute of Plant Industry at Indore. It is hardly possible to over-emphasise its importance.

3 *The systematic botany of cotton*—This is still in considerable confusion largely because it has never been tackled thoroughly from the modern aspect. Success here must depend on the satisfactory carrying out of the study of unit species.

4 *Root characters*—The root systems of various cottons and their relation to the yield and quality of cotton grown on different types of soil have been little studied. This aspect of cotton improvement will now be investigated at Indore, but should also receive attention in other tracts. A study of the root systems of cotton grown on the silt soils of Northern India is obviously necessary and could well be made an important item in the Committee's Punjab research scheme. Many experienced agricultural workers consider that work in this direction is likely to provide an explanation of low yields and of its unsatisfactory or variable quality.

5 *The water requirements of the cotton plant*—The importance of a study of the water requirements of different types of cotton and the effect of either an excessive or defective supply on yield and quality is not only obvious but has been strongly urged on more than one occasion*. As has been stated above, some preliminary results have been obtained but there is great need for exact work under both irrigation and rainfall conditions. Probably the Committee's grant for the Punjab research scheme will enable a commencement to be made in the study of this problem under Canal Colony conditions and it is understood that work of this nature is contemplated in Sind also. For the non irrigated tracts the loss of crop caused by excessive or untimely rainfall is perhaps the most important factor. Here the question appears to be largely a question either of root development and soil aeration or of the effect of climatic factors on bud, flower and boll shedding, these again are obviously related. The necessity for thorough and exact experimental work can hardly be over-emphasised.

6 *Boll flower and bud shedding*—Reference has already been made to the work in progress but it should be emphasised that more extensive investigation is necessary and that such work should be developed until definite conclusions are reached. Only for very limited areas has even approximate information as to

* See Proceedings, Board of Agriculture in India, Poona 1917

the extent of such shedding been obtained and only in the two instances referred to above has an attempt been made to ascertain the relative importance of insect attack and physiological causes in shedding. The effect of such shedding on yield and quality has not been quantitatively determined.

In particular it appears necessary to provide for the continuation and development of the work at Coimbatore.

7. *Effect of climatic conditions on lint quality.*—Attention is invited to Section V of Mr. Hilson's memorandum. As has been said above, such work until recently was almost impossible since a means of determining quality with some approach to accuracy is essential. The proposals involve the collaboration of a number of agricultural officers with the Technological Laboratory. The seasonal variation in quality of different standard varieties must be determined by the Technological Laboratory for its own requirements. The growing, under standard conditions on experimental plots of reasonable size, of those strains of cotton which are being pushed into general cultivation, is generally accepted as part of the normal work of a cotton station. If the extra records suggested could be maintained and utilised additional information of very real value would be obtained.

8. *Maturing of the fibre in the boll.*—Among the questions to which an answer is required are the following :—

- (a) Why are certain pickings, often the first, inferior in quality ?
- (b) Is there any connection between the length of the staple and the period of time which the boll requires to mature, or is the former character purely varietal ?
- (c) What are the causes which lead to inferior cotton at the end of the crop and does soil moisture become a limiting factor before the fall in temperature or natural senescence ?

So far as the first problem is concerned it is probable that an examination of cotton from various pickings in the Technological Laboratory may show in what measurable characters the defective pickings differ from the normal as well as providing a quantitative measure of the difference in spinning value.

Expressed in another form the two latter questions may be re-stated as follows :—

Is there any climatic limitation on the maximum length of staple which can be properly matured in a given tract independently of the limitations which climatic conditions enforce in respect of the agricultural characteristics of the plant such as the length of the vegetative period ?

The importance of (b) and (c) lies in the fact that there may be a maximum length of staple, quite independent of the agricultural characteristics of the plant, which can be matured under certain climatic conditions.

9. *Insect pests.*—It follows from what has been said above that there is immediate need for further research on control measures for the stem weevil and the Jassid group.

The fact that stem weevil is spreading in Madras, where it is a major pest, and that it has been recorded as an occasional pest in other parts of India cannot be ignored. It is held by several workers that attacks by jassids, etc., prevent the introduction of certain varieties into tracts for which they would otherwise be suitable thus placing an undesirable limitation on the improvement of staple ; the need for proper investigation is obvious.

10 *Causes of resistance to pests and diseases shown by certain varieties.*—There are at least two instances where practical results might be expected

(a) It is generally accepted in India that cottons with fully hairy leaves are hardier and less liable to attack by certain insects than smoother leaved varieties (There also appears to be a linkage between hair on the leaf and fuzz on the seed) We have at present no information as to whether the value of the hairs is entirely due to the fact that hairy varieties are unattractive to jassids and similar pests or whether the reason is more fundamental and that the hairs by regulating transpiration enable the plant to withstand extremes of climate

(b) *The bio-chemistry of the cotton plant with reference to pests and disease resistance*—In Madras there is considerable evidence that *Hirsutum* cottons are more susceptible to stem weevil damage than indigenous varieties though the latter are far from being immune There are also indications that certain strains within varieties are less susceptible than others It is not unlikely that a difference in the composition of the cell sap is the real reason If this were so a definite method of testing the suitability of a strain to a stem weevil area would be available and information might be obtained which would lead to cultural methods being evolved which would reduce the damage caused by this insect

Again the search for wilt resistant varieties is an important item of the agricultural department's work both in Bombay and the Central Provinces *Hirsutum* varieties are practically immune and one of the Burmah cottons (*Wagys*) is relatively immune Here again knowledge of the underlying causes of resistance would be invaluable to the plant breeder

11 *Cotton Cytology*—The most important recent work on this subject is that carried out at the Shirley Institute by Denham which has afforded an explanation (difference in chromosome number) why attempts to cross American with Asiatic cotton have failed Denham's results also suggest conditions under which such crosses might conceivably be achieved Some interesting results have recently been published by Saitzeff describing work done at the Turkestan Plant Breeding Station Though of obvious importance to practical cotton breeding little if any work has been done on this subject in India and it is considered that such work should be undertaken

12 *The improvement of existing agricultural varieties*—In an earlier chapter of this report a review necessarily extremely brief has been given of work in progress for the production of improved and uniform types to replace existing mixtures The necessity for constant attention to the improvement of staple has also been emphasised In the following an attempt is made to point out on what varieties work is particularly needed it being understood that the continuance and development of work already in progress is presumed

(1) *Bani Cotton*—This cotton is generally considered to be the original *G. indicum* It is characterised by a low ginning percentage and generally speaking is a shy yielder and somewhat delicate On the other hand particularly if carefully ginned it is an extremely valuable cotton from the spinner's standpoint and is probably the best of the indigenous Indian cottons in regard to staple This cotton now exists in a tolerably pure form mainly in the Hyderabad State Little work has been done on it from the botanical aspect and the isolation and

study of pure strains has not yet been undertaken on any considerable scale. If this cotton will grow normally at Indore the necessary work can be carried out at the Institute of Plant Industry ; if not, a study of this important cotton should be provided for either in the Hyderabad State or in a suitable part of the Central Provinces.

(2) *Malwa Cotton*.—Little work so far has been done on this promising Central India cotton but arrangements have now been made for the study of this type at Indore.

(3) *Dholleras*.—This term includes many dissimilar cottons aggregating over one-tenth of the total Indian cotton crop. The work in progress on the *Wagad* type and the position in regard to the *Lalio* constituent have been referred to. But a considerable portion of the Dholleras tract now grows the short staple *neglectum* type, known as *Matthio*, which is of an entirely different character. The improvement of *Matthio* seems to offer little prospect of success and its replacement by an early-maturing strain of *Wagad* is being aimed at. If this cannot be done further investigation will be necessary.

(4) *Bengals—United Provinces Type*.—A reference has already been made to the work in progress and to Dr. Leake's work, which was directed to the creation of hybrid cottons of definitely superior staple. It is obviously important that arrangements should be made for the continuation and development of the latter.

General remarks on problems regarding investigation.

Preservation of types obtained in the course of plant-breeding work.—In connection with their recommendations for future work on cotton genetics and the systematic botany of cotton the Central Cotton Committee desire that a point to which they attach great importance should be brought to the notice of all scientific workers on cotton. In the past many pure strains of cottons have been isolated in the course of plant-breeding work but, having been rejected as unsuitable for introduction into general cultivation, have been neither described nor maintained. As a result much important material for future work which would have been of the greatest value to later workers has been lost and instances have already occurred of work having to be repeated in consequence. It is strongly recommended that when "unit species" have been isolated and tested they should be fully described and maintained even if they are not of immediately obvious economic importance.

The relation of the Technological Laboratory to agricultural work.—It will be clear from the foregoing that the work of the Central Cotton Committee's Technological Laboratory forms an integral part of the Committee's agricultural research programme. The Spinning Laboratory now provides facilities for the testing of new cottons for agricultural departments which is in itself a distinct advance. This side of the work was intentionally established first, not only because Agricultural Departments require the information which spinning tests alone can provide but because, in the present state of our knowledge, the spinning test must form the basis of other work on the cotton fibre. It is the intention of the Committee to develop fully the work of their Research Laboratory where the measurable characters of the cotton fibre and their effect on spinning value are being studied on the lines already indicated.

The Committee's own sphere of work—It will be obvious from the foregoing that since their resources are limited the Committee must continue to leave to Provincial Departments of Agriculture the many problems of immediate practical application and concentrate on those problems which though of definite economic importance are more purely scientific in character and of more general application. From this standpoint the existing organisation largely covers the ground and in particular the further development of the two central research institutes (the Technological Laboratory and the Indore Institute of Plant Industry) would provide for almost as much additional work as the Committee can finance. These two institutions will need to expand in the future if they are to follow up their successes and some of the provincial aided schemes are also likely to justify further development.

Cotton literature—Before discussing the measures to be adopted and the policy to be followed in meeting the requirements outlined above one further point of practical importance should be mentioned. Mr. Hilson's note explains in detail the difficulties met with by agricultural workers in regard to literature. The Indian Central Cotton Committee agree that work done in India for the improvement of cotton growing is quite inadequately abstracted and summarised and workers in various parts of India are not acquainted with the work done in other parts of the country. The Committee have decided with the approval of the Agricultural Adviser to the Government of India to arrange for the publication of abstracts of cotton literature in the *Agricultural Journal of India*. This in itself however is inadequate for the scientific worker needs to be kept informed of the results achieved by workers on crops other than those on which he himself is working, not only may such results bear on his own work but a knowledge of the technique used by other investigators may be extremely useful. Hence the Committee have advised that the general question of the abstracting of Indian agricultural literature should be considered by the Board of Agriculture.

IV—FUTURE POLICY

An examination of the financial position of the Committee has shown that for a period of five to six years at any rate they can augment their expenditure on agricultural research for the improvement of cotton growing. But it will be obvious from the foregoing that there is far more work waiting to be done than the Committee could ever hope to finance even were it desirable that they should do so.

The supply of scientific workers—Even more important than the supply of funds is the provision of scientific workers for as has been said above it is the paucity of qualified workers which is limiting progress. Speaking broadly agricultural research and education in India is only some eighteen years old and to those who know the circumstances it is not surprising that post graduate training in agricultural science is backward. But the fact cannot be ignored that the position to day is very different to what it was in 1921 when the Committee first considered the question. In 1921 there was every indication that the agricultural departments in the cotton growing provinces would be strengthened it was understood that the recommendations of the Indian Cotton Committee (of 1917-18) for the employment of additional expert staff had been generally accepted and

that appointments would be made at an early date. That hope has not been realised and for India as a whole the loss of experienced men has more than counter-balanced any additions. A definite policy for the provision of the necessary scientific workers is therefore incumbent on the Committee.

Research Studentships.—Realising that the establishment in the country of a corps of scientific workers, experienced in the application of research methods to cotton problems, was essential to sound and steady progress the Committee at the earliest opportunity initiated their Research Studentship Scheme with that end in view. With the cordial support of experienced investigators that scheme has already become an important feature of the Committee's work and must continue to be so though disappointments will doubtless be met with. The time has now come to provide for future developments and the Committee has adopted the principle of providing a limited number of senior research studentships to enable the most successful of their junior research students to proceed further and again the experience necessary to qualify them as independent investigators. The time has not yet come, however, to provide a fixed number of such senior studentships annually. Appointments to such senior studentships may also be made from amongst highly qualified Indian graduates, who have had post-graduate experience abroad and whom it is desired to secure for cotton research work. Such senior students should be capable of undertaking, either at once or at a comparatively early date, the investigation of major problems. In exceptional cases it may be worth while sending specially selected Indian workers abroad for the study of particular problems but we do not contemplate this as a normal method of training;

Future employment of Research Students.—It is also necessary to consider in what manner trained investigators, which it is the object of the Committee's studentships scheme to provide, can best be utilised on the completion of their training. The funds at the Committee's disposal are quite inadequate to provide for all the investigations which have been shown to be necessary and it follows that many of them will not be undertaken unless, provincial departments of agriculture can secure further funds for cotton research. There is a very definite limit to the number of ex-students who can be employed on research schemes financed by the Committee. It is clear that such trained investigators as we hope to provide are badly needed in provincial agricultural departments but their absorption into those departments is complicated by the fact that, except when definite extensions of work are being undertaken, their employment might interfere with the normal promotion of men educated in the agricultural colleges who have gained their further training by practical work in the departments. It is important therefore that the Committee should obtain from Local Governments some indication as to whether they can provide larger funds for cotton research in the near future and of the extent to which men who have been trained through the medium of the Committee's research studentships can be employed.

Scientific staff for immediate requirements.—The Committee consider that in the application of the additional funds for agricultural investigations for the improvement of cotton growing they should concentrate largely on the provision of additional scientific workers.

It will be clear from our general review of the position of cotton research that not only are urgent problems being left unattacked but the further development of the work now in progress is being checked by lack of experienced scientific investigators. It seems improbable that provincial departments of agriculture will be in a position to increase their research staff appreciably during the next few years. In order to speed up the improvement of cotton growing the Central Cotton Committee have decided to modify their earlier policy and when necessary, to employ staff themselves which would be lent to agricultural departments where there is definite work to be done and where the Local Government would welcome them. Such staff would be definitely provided for the study of specific problems. In filling such appointments the Committee would follow its present procedure of advertising in India and abroad at the same rates of pay. But the Committee desire to state clearly that their object is to increase the number of qualified scientific workers employed in India on cotton research and not merely to improve the pay of existing workers or to encourage transfers from one post to another. It follows that the Committee would only consider employing a man already serving in a provincial agricultural department if he applied with the express permission of the Local Government. Where it is necessary to secure a scientist from outside India the most satisfactory way of securing prompt results is to offer a salary sufficient to attract a man who has already established a reputation as a successful investigator.

V —GENERAL CONCLUSIONS

The general conclusions of the Indian Central Cotton Committee on the above report are —

- (1) The Committee's existing research schemes are on right lines
- (2) For the next five years by adopting a definite financial programme the Committee can increase their expenditure on agricultural research by about Rs 2 lakhs per annum
- (3) It must be definitely understood however that the Committee can commit themselves to an annual expenditure of say Rs 7½ lakhs per annum for a period of five years only from March 1926. After that they will have to either curtail their programme or secure an amendment of the Cotton Cess Act raising the amount of the cess. Their opinion is that if the Committee could come forward after seven years of sound work and show not only that unless the cess were raised research work would have to be curtailed but that results of real importance had been achieved there should be no difficulty in securing increased funds
- (4) The amount of research work on cotton which requires doing is enormous, and it is quite impossible for the Committee to attempt to cover the whole field. In the selection of the problems to be financed from their grants it is essential that the Committee so frame their programme that there will be no encouragement to provincial agricultural departments and provincial Governments to curtail or postpone the extension of their own work

- (5) The organisation which the Committee have adopted is adequate to deal with as many investigations as they can afford to finance. The Committee's future programme must take into consideration the possibility of developing existing schemes ; this particularly applies to the two central research institutes.
- (6) Any increase in expenditure on agricultural research which the Committee undertake during the next few years, should be largely devoted to the provision of a larger number of qualified scientific workers.

APPENDIX.

The Improvement of the Cotton Crop by G. R. Hilson.

This article embodies a survey, in some detail, of the problem of the improvement in yield and quality of the cotton crop. This survey was prepared with special reference to conditions in India but as in its broader aspects it is of more general application it may be of interest to others outside that country.

Analysis of the Problem.

Beginning at the point in which the grower is most interested and which it is the final aim of research work to influence favourably, *viz.*, the value of the crop per acre, and working backwards the following analysis of the problem is arrived at.

Value of crop.—The value of the crop per acre depends upon the yield per acre and the price which in the main depends upon the quality of the produce (lint).

Yield per acre.—This depends upon the number of plants per acre and the yield per plant. Each of these factors in turn depends upon the interplay of hereditary characters and environmental factors.

Quality.—The quality of the produce similarly depends upon the interplay of hereditary characters and environmental factors.

II. *Hereditary Characters* (1).—Those which affect the yield per plant are :
 (a) The number of bolls per plant. (b) The number of loculi per boll. (c) The number of seeds per loculus. (d) The weight per seed. (e) The weight of lint per seed.

(a) The number of bolls per plant depends upon the habit of the plant, the length of term and the vigour of the plant.

The habit of the plant.—Under this head are included, the height of the plant, the number of vegetative branches developed from the axillary buds on the main stem and from the accessory buds if such develop, the number of fruiting branches borne on the main stem and on the vegetative branches, the number of nodes on the fruiting branches, the length of the internodes, the angle at which the branches are carried in relation to the main stem and the toughness of the wood. The last three characters affect the ability of the plant to carry its crop to harvest without breaking down before the bolls mature and burst. The others determine the number of flower buds produced.

The length of term—This is affected by the habit of the plant (a plant which produces its first flowering branch low down the main stem will flower earlier than one which does so high up the stem) but also depends upon the rate of growth of the main stem, the vegetative branches and the fruiting branches, the interval between the appearance of the bud and the opening of the flower and the interval between the opening of the flower and the bursting of the boll.

The vigour of the plant—By this general term may be described the constitutional ability of the plant to withstand excess or defect of moisture, to resist the attack of pests and diseases and to mature a high proportion of bolls to buds produced. In this connection the rooting system of the plant and the development of the anthers are probably factors of importance. The presence or absence of hairs on the leaves is certainly of importance in relation to the attack of the Jassid (*Empoasca devastans*)

(c) *The number of seeds per loculus*—This is affected by the number of loculi per boll and may depend on the number of ovules per loculus and on the size of the loculus

(d) *The weight of lint per seed* This depends upon the number of hairs per seed and the weight per hair. The latter depends upon the length, cross-section and specific gravity, characters of importance affecting the quality of the lint.

(2) Characters which affect the number of plants per acre are :—

The habit of the plant which determines the amount of space required by the plant in order to develop fully, length of term, which affects the amount of space desirable to allow the plant under given conditions and vigour, which affects the ability of the plant to survive

(3) *Characters which affect the quality of the lint*—The most important of these from the point of view of the producer of raw cotton are —Length strength fineness, colour, lustre, and uniformity in each of these. The other characters such as porosity, extensibility, etc., are not such as are simple of determination and are better dealt with in a technological laboratory

(4) *Other characters*—Besides the above-mentioned characters there are others, such as the colour and the size of the flower, the size and shape of the leaf, the presence or absence of nectaries, etc., which may or may not have any connection with the yield of the plant or the quality of the lint, but which are useful identification marks and enable workers to judge easily whether mixture is taking place either in the breeding plots or in the cultivators' fields

III *Environmental Factors*—These affect the yield per plant, the number of plants per acre and the quality of the lint. They are —

- (a) Climatic conditions
- (b) Pests
- (c) Diseases.
- (d) Water
- (e) Soil.
- (f) Manure.
- (g) Methods of cultivation

(a) *Climatic conditions*.—Under this head are included rainfall, temperature, humidity, sunshine, cloud and wind.

(b) *Pests*.—The chief pests are :—The pink and the spotted boll worms, the stem-weevil, the stem-borer, Jassids, aphids, the dusky and the red cotton bugs and certain other sucking insects which are probably instrumental in spreading fungoid and bacterial diseases.

(c) *Diseases*.—These are fungoid, *e.g.*, wilt (*Rhizoctonia*), bacterial, *e.g.*, black-arm (*B. Malvacearum*) and physiological, *e.g.*, red leaf disease;

(d) *Water*.—The effect of irrigation on a cotton crop, depends on the amount of water given, the time and method of application and on the composition of the water.

(e) *Soil*.—The fertility of a soil depends on its texture, depth and composition, which last term covers the whole soil complex, organic and inorganic ingredients and living organisms.

(f) *Manure*.—The effect of manure on a cotton crop depends on the kind and quantity applied and on the time and method of application.

(g) *Methods of cultivation*.—Under this term are included the various methods of preparing the land for the crop, sowing the seed, cultivating the crop after the seed has germinated and the various rotations of which the cotton crop forms a constituent.

From the foregoing, it is evident, that a complete scheme of agricultural research, aiming at the improvement of the cotton crop in regard to yield and quality of produce may be divided into two main divisions. In the one will be included matters concerning the heritable characters of the plant and their mode of inheritance and in the other matters concerned with the environment.

Before proceeding to discuss in detail these two divisions, it is well to draw attention to two important considerations. First, in the case of the heritable characters, while their expression in the plant is affected by the environment and while as characters they cannot be altered by human agency yet they can be manipulated and made to combine in a manner which will result in some degree in the improvement aimed at. Secondly, in the case of the environment, though some of the factors are within human control and can be varied so as to bring about the desired improvement, others are not. In their case, however, a knowledge of the effect of variations in them is of importance in estimating the effect of variations made in those under control. This knowledge is also necessary to prepare a forecast of the time at which a crop will come to harvest, the yield it is likely to give and the quality of the produce which will be marketed. The more exact this information is the more likely is the forecast to be correct.

Turning now to the consideration of these two main divisions, heredity and environment, matters concerned with the former will be taken first.

IV. *Heredity*.—In a study of the inheritance of the cotton plant, there are three processes to be gone through :—

- 1) The recognition of the heritable characters and their definition or method of measurement.

- (2) The isolation of pure strains in which the heritable characters are combined in various ways
- (3) The manipulation of these characters by crossing strains with the object of forming new combinations of characters and the study of the results obtained

Items (1) and (2) are generally carried out simultaneously and together form the foundation of all plant breeding work on cotton. Item (3) is carried out by making crosses between strains of the same or of different species and applying ordinary plant breeding methods.

The more important heritable characters, having an obvious bearing on the economic position and upon which research should be first directed are —

Lint —Length, strength, fineness, colour, lustre, uniformity in each of these and weight per seed

Seed —Weight, size, presence or absence of fuzz, number per loculus

Boll —Number of loculi, size, shape, manner of opening

Leaf —Presence or absence of hairs.

Plant —Habit, length of term, vigour.

Other characters such as colour of flower, type of leaf, presence or absence of nectaries, colour of the fuzz on the seed, etc., are in the light of present knowledge of less importance. Many of them can be studied while dealing with the other more important characters.

The chief defects from which Indian cotton suffers are that the staple is short, the average yield per acre is low and there is frequently too high a percentage of leaf present in the sample. A considerable improvement in the last-named detail could be brought about if the size of the boll were increased and the sectors of the capsule opened more widely. Work in the inheritance of characters should therefore aim at the removal of these defects.

V Environment *Climatic conditions* —It is well known to everyone who has experience of cotton that variations in climatic conditions have an enormous influence on the yield and quality of the cotton crop. As an extreme example it may be quoted that Cambodia cotton grown under fair conditions in South India will grow to a height of four to five feet and will give a yield of 1,000 lbs of seed cotton per acre, whereas if grown in North India, it tends to grow to a much greater height and give no yield.

This knowledge of the effect of season in the cotton crop exists, but it is too general and needs to be systematized. As a means of doing this it is suggested that the following scheme should be carried out each year for a number of years —

- (1) At each agricultural station in each important cotton tract, a plot of the particular pure strain of cotton evolved at and distributed from that station should be grown as far as possible on similar land and under similar cultural conditions.
- (2) Throughout the year a daily record of rainfall, temperature, humidity, etc., should be maintained at each of these stations.

- 3) Throughout the growing season a daily record of flower-buds produced and shed, flowers opened, bolls shed and burst should be kept for a group of plants in each of the plots.
- (4) A record of the treatment given to the plot and of any occurrence such as an attack of pest or disease should be maintained.
- (5) The yield obtained from the plot should be recorded.
- (6) A sample of the seed-cotton obtained should be sent to the Technological Laboratory for a detailed examination of the lint to be made and for a spinning test to be carried out.

By doing this an exceedingly valuable set of records could be obtained. After some years the information collected would make it possible to interpret more accurately the effect of seasonal variations in different parts of the same tract. As a result a more reliable forecast of the probable yield and quality of the cotton from that tract could be arrived at than is the case at present. Moreover, such information is very necessary if the results obtained from experimental work affecting other environmental conditions under human control are to be correctly interpreted. Also this information would be a distinct aid in calculating the chances of success of the introduction of a variety into a new tract.

Pests.—The problem of insect attack offers the following main lines of investigation :—

- (1) Description and life-history of the pest.
- (2) Habits of the pest, how it spreads and how it carries over from one crop to the next.
- (3) The amount of damage caused.
- (4) Means of control, by enemies, poisons or manipulation of the crop.

The description and life-histories of the more important of the insect pests of cotton in India are fairly well known. More detailed information in regard to items (2), (3) and (4) is needed, more particularly if local authorities are to be convinced of the need for legislative measures.

Except in the case of the Jassid, where the possession of hairs on its leaves affords to the plant a distinct measure of immunity from attack, breeding with the object of evolving resistant strains does not at present seem hopeful. It is, however, definitely known, in the Madras Presidency, that the stem-weevil and the spotted boll-worm and possibly the pink boll-worm show a decided preference for *Hirsutum* cottons as compared with the indigenous species. The reason for this is not known, but must lie in some constitutional difference between the two species as both are sown at the same time and are equally exposed to attack. This information if known would be a distinct aid to selection and breeding work aiming at the isolation of resistant strains.

Diseases.—Investigation of diseases follows similar lines to those indicated for pests.

Where the disease is definitely known to be due to an organism, the most hopeful solution of the problem appears to lie in plant breeding work aiming at the isolation of resistant strains.

Where the disease is known to be definitely physiological detailed investigation of the soil, the plant and the conditions of growth is necessary. It may also be possible to attack this problem by evolving strains which are not or are only slightly affected by the disease.

Water.—A certain amount of work on the use of water for the cotton crop has been done in India. Where, however, the crop has to depend mainly on the supply of irrigation water more information as to the quantity of water to be given per irrigation, the number of irrigations to be given in all and the interval which should elapse between successive irrigations is needed. This problem is, however, inextricably bound up with problems of soil, manure and methods of cultivation and has to be considered along with them.

Soil.—As yet only the fringe of the work lying waiting to be done on cotton soils in India has been touched. Broadly speaking the problem may be considered as falling under the four following heads :—

- (1) Mechanical and chemical analysis.
- (2) Fauna and flora.
- (3) Physical properties.
- (4) Climate.

It is not suggested that definite schemes should be formulated, having as their object the carrying out of wholesale surveys all over India along these four lines. Each may be approached through some definite problem the solution of which will yield results of economic importance.

For example under :—

- (1) There are indications that there is a relation between the quantity of a lint and (a) its chemical composition and (b) the chemical composition of the soil on which the crop was grown. Further enquiry is needed to establish definitely the existence of this relationship. If the results confirm this point the fact will be of importance in devising manurial experiments and a step toward the solution of the problem of levelling up the quantity of the cotton of a tract to a fairly uniform condition will have been taken.
- (2) The relationship between the soil organisms and the production of nitrates in the soil needs investigation. After soil moisture lack of nitrogen in the soil is the most important factor in limiting the yield of the cotton crop in India. Artificial manures to remedy this defect have either proved uneconomical or involve the possession of more capital than the average cultivator has at his disposal. Experimental work to discover cheap methods of increasing the efficiency of beneficial soil organisms is needed.
- (3) The investigation of the physical properties of the soil should go hand in hand with the investigation of problems of plant growth and of cultural and irrigation problems.

- (4) The examination of the soil climate is necessary in investigating problems of plant growth, *e.g.*, bud and boll-shedding. A knowledge of the relationship between the climate above ground and the soil climate, and the effect of variation in the latter on the plant would lead to a better understanding of the causes of variation in yield and quality of the crop, the first step in devising means of control.

Other problems will occur to other investigators and as the work proceeds. In time the whole field will be covered.

Manure.—A considerable amount of work on the kind and quantity of manure for the cotton crop has been done in India and some work on the time and method of application. Much work, however, remains to be done.

One of the outstanding manurial problems which has as yet not been solved is the economical manuring of black cotton. In certain parts on this soil an increase in the yield of the cotton crop by from 50 per cent. to 60 per cent. can be obtained by growing it after a leguminous crop. The introduction of this procedure in practice, however, cannot be recommended. If adopted the area under cotton and grain crops on the cultivator's holding would be reduced from one-half to one-third, and unfortunately the legume cannot always be depended upon to make up the loss on the grain crop. Along this line of attack the problem is bound up with the improvement of the other crops in the rotation. Some other solution may, however, be possible.

Methods of cultivation.—Much work has been already done in India on (a) preparatory cultivation, (b) methods of sowing, (c) spacing, (d) after-cultivation and some work has been done on rotations and mixed cropping as compared with pure cropping. There is, however, still work to be done along these lines.

A problem of some urgency is that of seed storage and the preparation of seed for sowing. Unaccountable failures of seed sometimes occur. The explanation for this may lie in—

- (a) The condition of the seed when put into the store.
- (b) The conditions of storage.
- (c) The treatment given prior to sowing.
- (d) Soil moisture conditions at the time of sowing.
- (e) The seed itself.

The question is of importance in connection with the distribution of seed to cultivators.

VI. *Literature.*—Finally the subject of literature has to be mentioned. A fairly complete list of references to cotton literature in all its branches is to be found in the *Journal* of the Textile Institute. There is, however, a considerable amount of information on work done in India, scattered about in annual reports and other publications. Some of these reports are not referred to in the above-named journal and since the wave of retrenchment passed over India the distribution of these reports has been curtailed. Moreover, the information referred to is mixed up with other matter. It would be an advantage to workers in India if this material could be collected together and arranged in a more accessible form.

APPENDIX XII.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S RESEARCH GRANTS

1	Director Technological Research Laboratory, Bombay	Mr A. James Turner, M A (Cantab, 1st Class in Tripos and in Part II), B Sc (London)	Recently Professor of Textile Physics, Manchester College of Technology.
2	Spinning Master, Spinning Laboratory, Matunga (Bombay)	Mr R. P. Richardson, London City and Guilds Full Honours Certificate	—
3	Senior Research Assistant (Chemist), Technological Laboratory, Matunga, Bombay	Mr D. L. Sen, M Sc Tech (Manch), M Sc (Bom), A I C	Recently Research student at the Indian Institute of Science and Manchester College of Technology.
4	Junior Research Assistant (Microscopist), Technological Laboratory, Matunga, Bombay	Mr H. N. Dutt, M B, B Sc	Recently Demonstrator in Botany, Gujarat College.
5	Junior Research Assistant, Physicist ..	Mr N. Hari Rao, M Sc (1st Class First), Calcutta University.	Indian Central Cotton Committee's Research Scholar (Textile Physics).
6	Junior Research Assistant, Physicist ..	Mr M. C. Bathija, B A (Hons), Bombay, M A (Cantab, 2nd Class 1922, in Part I, Natural Science Tripos 3rd Class, in Part II)	—
7	Statistical Assistant	Mr V. Venkatraman, B A (Madras) 1923, 1st Class Honours in Maths	Recently Statistical Assistant in Labour Office, Bombay.
8	Senior Tester	Mr K. Tarkundey, B Sc (Bombay)	Recently Fellow of Baroda College and Fellow of Royal Institute of Science, Bombay
9	Senior Tester	Mr S. D. Bhawe, B A, B Sc	Fellow of the Royal Institute of Science, Bombay
10	Electrician	Mr K. S. Venkatram Government Technical Board Examination, 1921	Bombay Electric Supply and Tramways Co
11	Junior Tester	Mr Y. M. Sathe, Inter Science (Bombay)	—
12	Junior Tester	Mr H. R. Nayak, Inter Science (Madras)	—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL
COTTON COMMITTEE'S RESEARCH GRANTS—*contd*

28	Junior Research Assistant	Mr N M Nitumargi B Ag (Bombay)	—	
29	Cotton Entomologist, Spotted Bollworms Investigation	Mr Ramrao S Kasargode L Ag (Bombay)	Assistant Professor of Entomology, Agricultural College, Poona—on deputation	
30	Research Assistant	Mr B P Deshpande B Ag (Bombay, 1st Class)	—	
31	Research Assistant	Mr S G Kadkol B Ag (Bombay)	—	
CENTRAL PROVINCES RESEARCH SCHEME				
32	Second Economic Botanist	Mr D N Mahta B A FLS	—	
33	1st Assistant to Economic Botanist for Cotton Central Provinces	Mr S C Roy L Ag and Post Graduate Pusa	On deputation from Central Provinces Agricultural Department	
34	2nd Assistant to Economic Botanist for Cotton Central Provinces	Mr D G Sawargaonkar L Ag (Hons)	On deputation from Central Provinces Agricultural Department	
35	3rd Assistant to Economic Botanist for Cotton Central Provinces	Mr D L Janoria L Ag (Hons)	On deputation from Central Provinces Agricultural Department	
36	4th Assistant to Economic Botanist for Cotton Central Provinces	Mr D Y Bhand L Ag (Hons)	On deputation from Central Provinces Agricultural Department	
37	Senior Mycological Assistant	Mr Jiwan Singh M Sc 1923	Research Student, Indian Cotton Committee 1923-25	
38	Junior Mycological Assistant	Mr M P Parthasarathy B A	Recently Mysore Department of Agri-culture	
MADRAS HERBACEUM SCHEME				
39	Herbaceum Cotton Investigator	Mr R Chockalinga Pillai L Ag	—	
40	Technical Assistant	Mr S N Venkataraman B A, B Sc	—	

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL
COTTON COMMITTEE'S RESEARCH GRANTS—*contd.*

41.	Technical Assistant	..	..	..	Mr. P. Abraham, B.A. (Botany and Zoology) 1st Class.	—
42.	Technical Assistant	..	..	..	Mr. C. C. Chandy, B.A. (Biology), 2nd Class.	—
INDORE SCHEME:						
43.	Director, Institute of Plant Industry, Indore.	..	..	..	Mr. A. Howard, C.I.E., M.A. (Cantab.)	.. Recently Imperial Economic Botanist.
44.	Physiological Botanist	..	..	..	Mrs. G. L. C. Howard, M.A. (Dublin)	.. Recently 2nd Imperial Economic Botanist;
45.	Assistant in charge of Field Experiments, Seed Farm.	..	..	..	Mr. K. R. Joshi, L.Ag. (Nagpur)	.. Lent by Indore State Agricultural Department;
46.	Junior Assistant	..	..	..	Mr. Kuber Singh, L.Ag. (Bombay)	—
47.	Fieldman	..	..	..	Mr. Sumain Singh	—
48.	Fieldman	..	..	..	Mr. V. R. Sathe	—
PUNJAB RESEARCH SCHEME:						
49.	Cotton Research Botanist	..	..	..	Mr. Trevor Trought, M.A. (Cantab.)	.. Recently Senior Botanist to the Ministry of Agriculture, Egypt
50.	Technical Assistant	..	..	..	Chaudhri Mohd. Akbar, B.Sc.	—

APPENDIX XIII.

INDORE INSTITUTE OF PLANT INDUSTRY.

The programme of cotton investigations submitted to the Central Cotton Committee in 1923 is given below —

The aim of the Indore Institute (as regards cotton investigations) is to provide a centre of research for the black soil tracts. At this centre any problems suggested, either by the Central Cotton Committee or by other workers in India, can be taken up. A special effort will be made to create a good library dealing with the various aspects of cotton production for the use not only of workers at the Institute itself but also of other investigators on cotton in India.

While the Institute will always be prepared to consider any useful suggestions as regards problems to be investigated, the following preliminary programme is put forward. This falls into four parts. —

(a) *Botanical Survey* — Up to the present, little or no attempt has been made in India to isolate, classify and study the unit species which form the framework of the various species and varieties of cotton found on the black soils. It is true that the Indian cottons have been classified and surveyed from the point of view of systematic botany, but this is entirely inadequate for modern work as by this method cottons of very different agricultural value are not distinguished. The work needs to be carried much further and nothing short of the isolation and study of the unit species will meet the case. This work has a direct practical bearing. It will, in all probability, lead to the isolation of useful types for distribution. It will also provide material for the plant breeder and for critical work on the physiology and agronomy of cotton.

(b) *Plant Breeding* — Two main practical problems will be taken up at once —

- (1) the creation, establishment and maintenance of an island of long staple cotton on the Malwa plateau. The types isolated will be available for other areas in India and the crop will enable a grade of improved cotton to be established for the mills and for the shippers,
- (2) the improvement of the fibre of the hardy *Roseum* type which is, in all other respects, admirably suited for the low-lying areas of Central India.

In the solution of these questions the inheritance of characters will have to be studied. The results will apply not only locally but will also be of general interest.

(c) *The Physiology of the Cotton Crop* — In order to increase production something more than improved varieties is needed. The new varieties must be provided with suitable conditions for growth. To discover these the physiology of the cotton plant must be studied and the factors which now limit production must be determined. This involves the study of root development, the relations of the root system to the soil type and the influence of factors such as soil moisture, soil aeration and drainage, soil texture and soil temperature on growth. Included in these studies is the discovery of factors which produce the shedding of buds, flowers and

bolts. During the course of these physiological studies, the general nutrition of the cotton plant will be considered and how far the yield can be improved by manuring and other methods of soil treatment.

(d) *The Influence of Environmental Factors on the Lint Characters.*—Modern industries demand a uniform product. Once this is obtained the purchase of raw material as well as the details of manufacture are simplified. In the case of cotton, any tract which can produce uniform lint will rapidly establish its reputation in the trade. It is well known, however, that the cotton fibre alters in character according to the soil on which it grows and to some extent according to the season. Further work is desirable on this matter with the object of discovering what factors bring about these changes, which varieties are most easily affected and whether any practical remedies exist for improving the uniformity of the fibre of the same cotton. This portion of the work is of direct bearing on the question of the maintenance of grades of cotton for the highest class of spinning in this country.

APPENDIX XIV.

LIST OF RESEARCH STUDENTS APPOINTED BY THE INDIAN CENTRAL COTTON COMMITTEE

117

Name	Age	Degree	University and years	Other qualifications	Where posted
Hari Rao N		M Sc (1st Class), Physics Calcutta University	TEXTILE PHYSICS Central College, Bangalore 1916-20 University College of Science Calcutta, 1921-23	—	Technological Laboratory, Matunga (Since appointed Junior Research Assistant at Technological Laboratory)
Kumana Sorab Edulji	24	B A (2nd Class Hons) 1922, B Sc (2nd Class) 1923	1918-22, Bombay Elphinstone College 1923 to date, Royal Institute of Science, Bombay, for M Sc	Research work in Physical Chemistry on boric and arsenic acids—the behaviour of their mixtures and the equilibrium, if any, existing between their ions in solution	Technological Laboratory, Matunga
Sen Kamakhya Ranjan	22	B Sc (Hons) 1st Class 1924 Physics Chemistry	1921-24 Dacca University, (Jagannath College Dacca 1919-21)	—	Technological Laboratory, Matunga
Roy, Prafulla Kumar	25	B Sc 1920 M Sc 1922 B T 1923	1920-21 Calcutta (Dacca Government College) 1921-22 (University College of Science, Calcutta) 1923 (Dacca Training College)	Research work on the diurnal variation of Natural Ionisation	Technological Laboratory, Matunga (Since resigned)
Rao, Lakshmi Narayana	26	B Sc (1st Class), 1921 M Sc (1st Class) Botany, 1924	1917-21, Mysore (Central College) 1921-24 Calcutta University	Research work on Plant Physiology and Histology Experience in Microtechnic, etc	Technological Laboratory, Matunga

RESEARCH STUDENTS APPOINTED BY THE INDIAN CENTRAL COTTON COMMITTEE—*contd.*

118

Name.	Age.	Degree.	University and years.	Other qualifications.	Where posted.
Banerji, I. . .	25	M. Sc. Botany (1st Class), 1922. Honours in Botany at B.Sc., 1920.	BOTANY. Calcutta, 1915-1922 (Presidency College).	Research Student, Botanical Section, Pusa, 1922 to date.	Coimbatore.
Desai, B. B. . .	23	B. Ag. (2nd Class), 1922. (1st Class Honours at Junior B. Ag. Examination), specialised cotton.	Bombay Agricultural College, Poona, 1919-22.	Worked at cotton breeding under Mr. Patel, Surat.	Dharwar.
Pande, Sheo Shanker . .	25	M. Sc. Botany, 1923. B. Sc. Biology group, 1921.	Punjab Government College, 1921-23, Allahabad. Agra College, 1917-21.	Published Thesis on <i>Marsilia crosa</i> for M.Sc.	Nagpur.
Mohammed Afzal . .	21	B. Sc. (Agri.), 1923, Gold Medal.	Punjab Agricultural College, 1919-23.	—	Lyallpur.
Datta, Atul Chandra . .	25	M. Sc. (1st Class) Botany, and top of the list in 1st Class Hons. at B.Sc., 1920.	Calcutta Presidency College to 1920. University Science College, 1920-22.	Research student under Dr. Bruhl. Joint author, papers on plant diseases (<i>Mitella</i>) and on Water Hyacinth.	Coimbatore.
Singh, Sant Bahadur . .	23	B.Sc. (2nd Class), Botany, 1921.	Banarès, Allahabad, 1922-24. (St. John's College, Agra, 1917-21.)	Research work in Plant Physiology on growth of cotton plant. Joint paper with Prof. Inamdar on this subject for Science Congress.	Surat. (Since resigned.)
Ali Akbar	20	B.Sc. April, 1922, and Post-graduate course.	1919 to date, Punjab Agricultural College, Lyallpur.	Research work on Plant-Physiology, Transpiration in Maize.	Lyallpur.

LIST OF RESEARCH STUDENTS APPOINTED BY THE INDIAN CENTRAL COTTON COMMITTEE—*contd.*

Name.	Age	Degree.	University and years.	Other qualifications.	Where posted.
Budra, Sohan Singh ..	24	M Sc, 1923, in Zoology by research Honours in Zoology at B Sc, 1922.	ENTOMOLOGY. Punjab Government College, Lahore, 1917-23	Published two papers on research done	Lyalpur.
Nangpal, Harbhagwandas ..	22	B Sc. (Hons) Zoology, 1923.	Punjab, 1917-23, Government College, Lahore.	Research on Metamorphosis of Wasp.	Cawnpore
Singh, Vishva Ram ..	23	L. Ag, 1924 ..	1920-24 (Agn. College, Cawnpore)	Research work on Pink Bollworm	Cawnpore
Trehan, Kedar Nath ..	25	B Sc. Botany and Zoology, 1919. M Sc., 1921	1915-19, Punjab (Gordon College, Rawalpindi) 1919-21, Punjab (Government College, Lahore).	Research work on Snakes, Thrips, etc.	Lyalpur.
Jivan Singh ..	22	M Sc., 1923 in Botany ..	MYCOLOGY Punjab Khalsa College, 1919-21, Government College, Lahore, 1921-23	Some Research work during M Sc (two years course)	Nagpur.
Kanadive, Jagannath Datatraya:	29	B. Ag, 1921 ..	1914-23 Bombay (Agricultural College, Poona).	Joint Bulletin with Prof. Ajreker on Potato diseases. Research in Mycology.	Dharwar.

APPENDIX XV.

PROGRESS IN THE INTRODUCTION OF IMPROVED VARIETIES OF COTTON IN VARIOUS PROVINCES.

Bombay—(1) Gujerat.—The policy of the Agricultural Department is to establish one variety of cotton throughout the whole of the area south of the Narbada. In this policy they are receiving the cordial support of the Baroda and Rajpipla States. The area south of the Tapti is now reported to be practically free from short-stapled varieties. North of the Tapti the Rajpipla State grows the same selected variety (1027 A.L.F.) as has been distributed in Surat. Considerable progress has also been made around Ankleshwar in replacing the old mixture by this valuable pure strain. The 1027 variety is now recognised by the trade as "Surat farm cotton" and as such fetches a considerable premium. Unfortunately, a shorter stapled variety is still grown in the Olpad Taluka which is not only inferior to "1027" in regard to staple but is impure and contains a considerable amount of Goghari. Unfortunately, the Co-operative Cotton Sale Societies in this taluka still persist in the distribution of seed of an inferior type which is temporarily popular because of its higher ginning percentage.

For the Broach tract, north of the Narbada, a pure type of superior staple intended to replace the present mixture is being tested on the Broach farm and preliminary arrangements for seed multiplication are now in hand. For the Dholeras tract four pure strains of Wagad cotton are now being multiplied on the cotton breeding station at Viramgaon and are also being tested on 150 acres under cultivators' conditions. In South Gujerat the seed multiplication organisation of previous years has been maintained. Private seed farms under departmental supervision aggregated to 11,500 acres from which over two million pounds of seed has been obtained for issue representing close on a quarter of a million acres. Only by the continued supply of controlled seed of known purity in this way can the whole of the cotton of the tract be brought up to the standard aimed at.

(2) *Southern Division.*—The systematic introduction of the improved varieties of Kumpta and Upland cottons, known as Dharwar No. 1 and Gadag No. 1, respectively, was continued. The areas under seed of known purity had been 90,000 and 95,000 acres respectively. Seed distribution was carried out in co-operation with the Co-operative Cotton Sale Societies of Hubli, Gadag and Bijapur and it is estimated that merchants supplied seed of high purity for approximately an equal area. The Cotton Sale Societies continued their periodical auction sales of improved types of cotton, grading being done by the cotton staff of the Agricultural Department. The kapas brought for sale by the societies represented some 30 per cent. of the produce of the seed issued. The extra price to the growers was estimated at Rs. 3,30,000. Private seed farms for the two varieties supervised by the Department occupied slightly over 7,000 acres, the seed issued for the current season being sufficient for approximately 202,000 acres.

The Cotton Transport Act has worked very satisfactorily in the Division by preventing the import of inferior cottons such as Bengals, Irani, and mill waste for mixing purposes. Complaints of the mixing of improved Upland with ordinary Dharwar-American continued to be received, but these should disappear automatically.

(3) *Khandesh* —The general distribution of pure *Roseum* cotton seed has been continued through registered seed growers, Seed Unions and Agricultural Associations. The Agricultural Department supplies seed for over 2 000 acres each year and arranges for the roguing of the fields and supervises the seed supply.

Experimental work, however, is directed to the obtaining of a type of cotton of superior staple and suitable to local conditions. Several such strains show promise and trials on a field scale are being conducted during the present season.

Punjab —There has been a further marked expansion in the area under Punjab American cotton. The principal variety is still 4F (which was first given out in 1923), the area in 1924-25 being 1,036,000 acres. A later selection 285F (first given out in 1921), which is earlier ripening, hardier and with a superior staple, was grown on 10,000 acres in 1924-25. A third selection (289F) is at present under trial by some of the larger growers in the canal colonies the area being about 2 000 acres. This variety is a little later ripening than others, but has a better lint and is a heavier cropper. Punjab cotton cultivators are now fully alive to the advantages of American cotton, in fact, if anything the tendency is to grow Punjab-American even when the land may hardly be suitable and irrigation supplies hardly adequate.

Work for the improvement of indigenous varieties has been continued. The "Mollisoni" variety, an improved strain of *indicum*, is being grown on 31,000 acres, whilst in the south east of the province, where due to lack of irrigation facilities American cotton cannot be grown, about 57,000 acres are under a selected strain of *Roseum*.

United Provinces —Attention has been concentrated on the extension of selected indigenous varieties. The selection known as A-19, a high ginning type with a staple better than the Aligarh White Flower type, is being introduced in the Western (Aligarh) Circle, and 5,000 acres have been put under controlled cultivation for seed supply during the present season with the object of securing a pure seed supply for 50,000 acres in the following year.

In the Bundelkhand Division and the Cawnpore District the selection known as J N 1 is spreading, and compact areas of this variety within easy reach of the Cawnpore market are increasing. An area of over 2,000 acres is at present under this variety and the organisation of the seed supply is receiving attention.

Selections made during the cotton survey and hybrids produced by the Economic Botanist are being established in parts of the Rohilkhand Division where a compact area suitable for the production of these varieties exists. It is reported that the impossibility of finding sufficient irrigation for the Cawnpore-American type will prevent any further extension of the areas under this cotton in the United Provinces.

Burma —Several improved strains are now under trial on a field scale. The area under improved Wagale increased by 1,474 acres and the area under Burma Cambodia increased to 3,087 acres of which 2,787 acres was in the Sagaing District and 300 acres in the Thayetmyo District.

Hyderabad State.—The Department of Agriculture has steadily followed the policy of encouraging the production of pure Bani (Hyderabad Gaorani) and of eliminating the short-stapled Khandesh variety. It is estimated that 600,000 bales of Bani was produced during the year under report of which 350,000 bales was produced by the two districts of Nanded and Parbhani in which now practically only this variety is grown ; 15,000 bales of pure Bani was also produced in the Bir District in the year 1924-25.

Baroda State.—The important cotton-growing areas of the Baroda State are much interlaced with those dealt with by the Bombay Department of Agriculture in the course of its operations in Surat, and the policy of previous years, *viz.*, to co-operate with the Bombay Department in the introduction of the 1027 type has been steadily followed. 361,800 lbs. of pure seed was issued and it is estimated that 42,000 acres have been sown with pure seed of this variety.

Rajpipla State.—In co-operation with the Bombay Department of Agriculture, this State has for some years systematically introduced the 1027 improved variety of Surat cotton for the replacement of existing mixtures and the process is now nearly complete with the result that the quality and reputation of the Rajpipla cotton have greatly improved and it is now recognised as equal to the best Surat and is much sought after.

G. CLARIDGE & Co., LTD;
CANTON WORKS, BOMBAY;